ICI MAGAZINE

OCTOBER/NOVEMBER 1965

ICI MAGAZINE OCTOBER/NOVEMBER 1965 VOLUME 43 NUMBER 326

CONTENTS


Michael Clapham


J. A. de Normann


R. J. Hatch


Harry Hutchison


A. S. Irvine


R. E. Jones

CONTRIBUTORS

Michael Clapham is the ICI director in charge of coordinating the Company's overseas policy and he also has particular responsibility for Australia, India and Pakistan, the Far East and Middle East and Arab North Africa. A printer by profession, he joined the Kynoch Press in 1938 and became its manager in 1940. He was appointed to the Metals Division Board in 1945 when only 33, becoming a joint managing director of the Division in 1952 and chairman in 1960. He was appointed to the ICI Board in 1961. His outside interests include printing, cooking and, as the owner of a narrow boat, canal navigation.

J. A. de Normann is manager of ICI's Building Development Group. He joined ICI in 1947 and spent a number of years as a representative in the Organic Chemicals Sales Department of the then Southern Region Sales Office. After a time as personal assistant to Sir Ewart Smith he went for two years to ICI (New York). From there he returned in 1957 to be development manager and later research and development manager of Nobel Division. He took up his present appointment at the beginning of this year. His main interests are motor racing and travel.

R. J. Hatch is employed on the 'Fluon' plant at Plastics Division's Hillhouse Factory. He joined the Company in 1962 after five years in the laboratories of Blackpool Grammar School. He was previously in the Royal Navy which he joined from school. He is married with 3 children and his hobbies are gardening, snooker and crown green bowling.

Harry Hutchison has been Nobel Division publicity officer since 1951 and editor of *Nobel Times*, the Division newspaper, since its inception in 1955. He joined the Company in 1928 and worked for many years on the research side before moving over to publicity work in 1948. He is an occasional contributor to the Scottish press with a bias towards articles on historical subjects.

A. S. Irvine, manager of the Mond Division Information Service, joined the then Alkali Division in 1934 from Oxford, where, in the intervals of rowing, he had read chemistry. In 1942 he was seconded to the Alkali and Chemical Corporation of India to start up an alkali factory at Khewra and on his return to England in 1946 he took charge of the Division's internal communication organisation. His leisure activities include Anglo-French relations in local support of the twin towns movement, gardening (which he hates), watching rowing and keeping a good table.

R. E. Jones, an ICI Fibres Ltd area sales manager in Manchester, can claim to be one of the 'Terylene' pioneers, having joined ICI's Fibres Development Department in 1948. Among the many jobs he has held in the synthetic fibres field was a recent stint in the USA with ICI's associated company Fiber Industries Inc, during which time he visited Middlesboro, Kentucky, about which he writes on page 170. This was Dr. Jones' second stay in the USA, his first being as a student at MIT immediately after the war. His outside interests include things Spanish and Spanish-American, golf and railways.

Philip Reilly is a member of the Communication Section of the Central Personnel Department

FRONT COVER: *Platform Party, launch of the "Ocean Prince." (Photograph by HOC Division Photographic Section)*

The *ICI Magazine*, price fourpence, is published every other month. It is printed by The Kynoch Press, Birmingham, and published by Imperial Chemical Industries Limited, Imperial Chemical House, Millbank, London S.W.1 (VICtoria 4444). The editor is glad to consider articles and photographs for publication from members of the Company, and payment will be made for those accepted.

OVERSEAS

by Michael Clapham


The Montreal headquarters of Canadian Industries Ltd

THE Annual Report reminds us that ICI is not only a company operating in the United Kingdom, but also the centre of a Group; and that while ICI itself only sells about a third of its products overseas, the overseas sales of the ICI Group are nearly half its total sales. What is this Group? Where is it? Why is much of it outside the United Kingdom —why do we invest in factories overseas instead of exporting from this country? And how, particularly since the recent reorganisation, are our overseas interests organised, supervised and managed? These questions are often asked by people interested in our activities, not least in Staff Committees and Works Councils.

What is the ICI Group?

The Group figures we publish each year are those of ICI and all its subsidiaries; that is, all companies in which ICI owns more than half of the ordinary capital. They include UK companies, such as ICI Fibres and Imperial Metal Industries, as well as those in other countries. This article refers only to overseas companies in the Group, including for the sake of completeness some in which our share is 50% or less. These are described as associated companies: their sales and profits are not included in the published figure of Group sales and profits, and only our share of their capital and dividends appears in the balance sheet and accounts. Conclusions drawn from Group figures can thus be misleading to the unwary.

With that caution, we can start with the published facts. At the end of 1964 the total assets of the ICI Group were £966 million. Of these, about £250 million, or just over a quarter, were overseas. The Group sales were £720 million, of which £346 million, or just under half, were made overseas; and of these £135 million were ICI exports from the UK while £156 million were manufactured overseas, the balance being agency and venture trading, freight and duty.

"Windows on the world." Above: The view from the ICIANZ sales office in Sydney Below: The ICI China office in Hong Kong looks over to Kowloon

ICI's overseas interests: selling

Numerically, most of the ICI companies overseas are our network of selling companies round the world. They are a vital part of our organisation for exporting: our shop windows and our windows on the world. Having our own companies in 48 countries enables us to get a better view of their opportunities and to serve and develop their markets in the way an agent working on his current commissions could not afford to do. Equally important, these companies have traditionally provided a base from which to launch into manufacture when the time comes for that—a question which is dealt with later.

A book could be written on our selling offices alone, and it is invidious to pick out a few; but I must risk this in order to give some idea of the colour, the variety and the romance behind the colourless figures we serve up as the "Geographical analysis of ICI exports." Take, then, on the other side of the world, the handsome block of ICIANZ's sales office in Sydney, looking over Circular Quay, the great Harbour Bridge and Sydney Cove, where the eleven ships of Captain Phillip's first expedition anchored on 26th January 1788, having found in Port Jackson a harbour where "a thousand sail of the line might ride in perfect security," and where now the ocean liners slide in among the bustling ferries. Or Hong Kong, where the ICI office stands on a harbour crowded with merchant ships and Chinese junks, and in addition to serving the thriving industries of the Colony maintains the island's original purpose of contact with the huge but not easily accessible markets of China itself. Or Kuala Lumpur, where the telephone operators direct to the right section an enquiry for paint in Malay, for dyestuffs in Chinese, or for fertilizers in English. Or Calcutta, and the ICI (India) sales office overlooking the Hooghly River, where the East Indiamen used to work up under sail through the ever-shifting mudbanks and now the merchant ships unload among their many cargoes some of ICI's £6 million exports to India. Or São Paulo, the glittering commercial centre of Brazil, where the number of skyscrapers visible from ICI Brazil's office windows is alleged to need a recount monthly. Or Istanbul, the ancient meeting point and market for Europe and Asia: in the ICI office at the mouth of the Golden Horn, perhaps the world's most polyglot port, the four senior managers speak between them eleven languages to my knowledge, though no doubt I underrate them. Or Rotterdam, where the ICI office stands on the old wine harbour, though the lighters now unload more drums bearing the ICI roundel than they do casks of wine, and you can take a boat through the world's busiest harbour to our new manufacturing site at Rozenburg.

ICI's overseas interests: manufacture

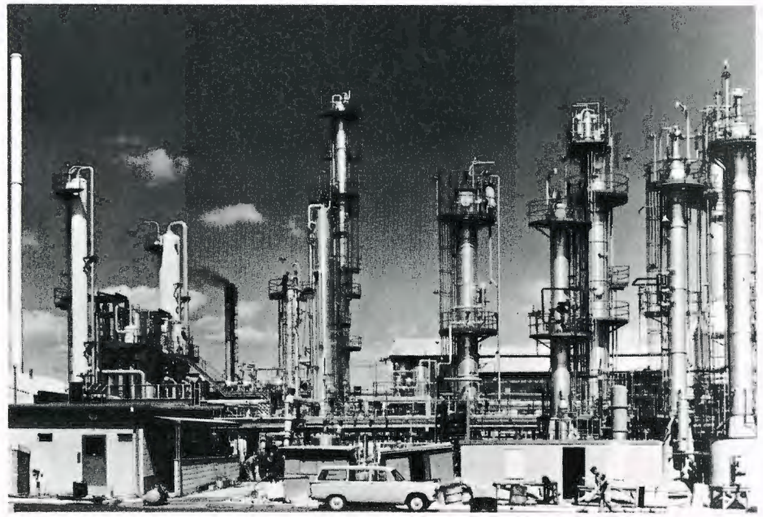
With Holland as a reminder of the way in which an export market and an efficient selling company can provide an entry into overseas manufacture, let us return to the questions of where, how, and why we invest in manufacturing overseas. First, where do our major investments lie?

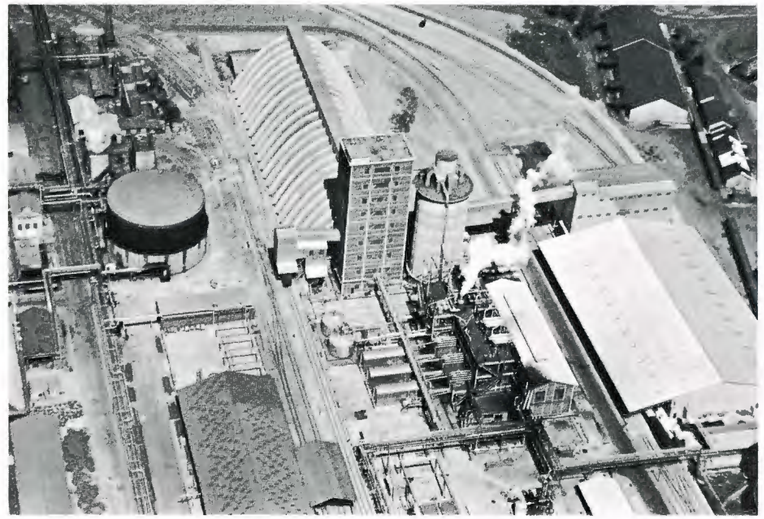
Of the £250 million or so mentioned earlier as the overseas assets of the Group, the purely selling companies account for a very small fraction. About two-thirds of the total is made up by the three large and long-established companies manufacturing a wide range of ICI products—Imperial Chemical Industries of Australia and New Zealand Ltd; Canadian Industries Ltd, and African Explosives and Chemical Industries Ltd. Next come India, where the original selling company, ICI (India), supervises three manufacturing subsidiaries—Alkali and Chemical Corporation of India, Indian Explosives, and Chemicals and Fibres of India, and an associate company making dyes, Atic; and Argentina, where in recent years Duperial has developed from a small manufacturing company to a major one with the construction on a site at San Lorenzo, near Rosario, of plants making polythene, chemicals and vat dyestuffs.

After these companies and groups, whose assets range from £78 million down to £13 million, and whose factories number more than 60, there come—leaving out Europe for the moment—three in the £3 to £5 million class. Malaya, where a big plant making special compound fertilizers for rubber plantations is joining a recently started chlorine plant in the Chemical Company of Malaysia, and the factory of ICI Paints (Malaya) is being expanded; Pakistan, where the Khewra Soda Company is now increasing capacity and launching new projects; and Kenya, where the Magadi Soda Company has based a world-wide export business on the resources of Lake Magadi.

To these eight major overseas subsidiaries or groups must be added a number of smaller companies with manufacturing interests, ranging in size from a polythene pipe extruder and film unit in Chemical Industries (Colombo) to substantial companies like Pinturas ICI de Mexico. Even to catalogue all their products would take more space than I have got.

Surprisingly, until recently a list of the major overseas interests would have omitted Europe and the United States, the world's two greatest industrial areas. The main reason for this was that before World War II these markets were dominated by two great chemical companies which then overshadowed the smaller but growing chemical industry in Britain: E. I. du Pont de Nemours of the USA and IG Farbenwerke of Germany. It was not until after World War II that ICI was strong enough, and had enough new inventions of its own, to challenge them on their own ground; and then the pressure of post-war reconstruction on our resources of men and money allowed no diversion of effort from our existing fields of activity for the first ten years or so.



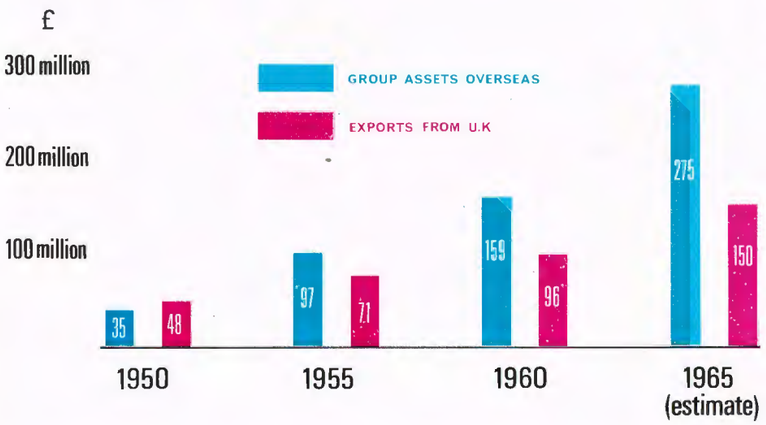


The manufacturing companies. Above: Part of the ethylene oxide plant in ICIANZ Botany factory. Below: Part of AE & CI's Modderfontein factory

Then came the formation of the European Council, the purchase of a site at Rozenburg and the building of 'Perspex,' 'Diakon,' polythene and now nylon polymer plants there, and of a nylon spinning plant at Oestringen, near Heidelberg; the acquisition of a paint factory in Hamburg; and the recent institution of ICI Europa; all episodes in the history of ICI's attack on the quickly growing markets of Continental Europe, which will probably be our biggest overseas investment area by 1975.

What then of the United States? ICI cannot neglect such an enormous and fast growing market for the newer chemicals, plastics and fibres, intensely competitive though it is. The long established office in New York, the purchase since the war of a small company making dyes and auxiliary products and its transformation into ICI Organics Inc., the major breakthrough into the polyester fibre market in minority partnership with American Celanese—a break-through we now hope to match with one in nylon—and our joint company with the US Rubber Co. to make chemicals for polyurethane foams, are the main outward and visible signs at present of ICI's activity in the USA. At this stage it can only be said that these do not indicate the limit of the Board's intentions. Strengthened as ICI is by a powerful

The manufacturing companies. Part of the factory of Indian Explosives Ltd at Gomia, in Bihar



manufacturing subsidiary in Canada, we now have at our disposal the knowledge and resources to go much further.

Why invest overseas?

For many people it remains a puzzle why, with the urgent need for exports from the UK and the difficulty of raising enough money to finance all the opportunities open to us, we still invest substantially in manufacture overseas.

It is worth noting at the outset that investment overseas often actually increases exports from the UK. A recent study of ICI's activities in 1950–64 showed that for every £1 of capital actually remitted from this country, purchases of UK plant and spares and of UK intermediate products for continuing use in the plants erected had brought back between £2 and £3, while the "associated exports"—products we sold overseas as a direct result of being established in manufacture—were estimated at as much again. That heavy overseas investment has not prevented ICI from increasing its exports is shown in the chart above.

The statement of ICI's overseas policy lays on all Divisions the duty of using our resources—both our tangible assets and the still more valuable resources of human skill and inventiveness and our accumulated fund of knowledge—to attack the markets of the world. Exports are the first weapon to hand; but they won't do for every situation. Sometimes we are faced with "natural protection," the cost of carrying heavy, bulky or hazardous materials to distant markets where the availability of raw materials means that as soon as local manufacture starts our exports will be unable to compete. In this situation we try to get in first as the local manufacturer when the market gets big enough to be served by an economical plant: hence ICI Group factories making soda ash on the Great Australian Bight and in the Salt Range of Northern Pakistan; and explosives factories near the Cape of Good Hope and on the western slope of the Andes.

More often, however, the protection is man-made. Most countries naturally want to become industrialised and envy the high standard of living in the advanced manufacturing countries; so they put on tariffs to protect their existing or projected industries from the competition of other countries, which to start with have all the advantages of knowledge and economical scale of manufacture. This is the situation we most often face: the choice between fighting the other chemical manufacturers of the world to get a fraction of a protected market, where tariffs and carriage costs absorb all or most of the profit; or to get in at the critical moment and capture, for a time at least, the whole market with a plant which *to start with* is often uneconomically small. Or again, in an industrialised market where we have established exports against local competition, we may see the chance of much bigger sales to customers who are only prepared to give a small share of their business to a selling company far from its manufacturing base. The problem in both instances is to pick the critical moment—for which our competitors are looking as keenly as we—neither coming in too early, when the minimum plant may be under-employed, nor too late, when a competitor may have got in and deprived us of both our export market and our chance to manufacture.

Circumstances like these will continue to lead us to invest overseas when we can only make the best use of our resources by doing so, and when we are prepared to accept the risks involved. Where we are unable to manufacture, as in the Communist bloc, or where we rate the political or economic risks too high, our policy is to license or sell our know-how. Both when investing and licensing, we look for every

A centre for sales and manufacture. Rotterdam, where the busy river links the long-established office of ICI (Holland) on the Wijnhaven with the new factory site at Rozenburg

opportunity of increasing our exports at the same time, either by selling finished products to develop the market or complete a product range, or by selling intermediates to plants engaged in a later stage of operations—ethylene from Wilton to a polythene plant at Rozenburg; nylon polymer and DMT to overseas nylon and 'Terylene' spinning plants; pigments and resins to paint plants round the world: one could quote many more examples.

Organisation and management

How is all this complex Group organised and managed and its future development planned? There is room here only for the barest outline, and I must exclude the recently established organisation for Europe, which is still being developed in detail.

Take management first. It has long been ICI policy that the overseas companies of the Group should, so far as possible, be managed by nationals of the country concerned; and while this is taken for granted in highly developed countries like Australia, Canada and South Africa, people are often surprised to find how effectively our policy has been carried out elsewhere. In India, for example, where the companies of the Group employ about 6250 people, there are now only 23 career expatriate staff, and throughout the world ICI long-term expatriates now number only about 180. Short-term secondments, generally technical staff for new projects, add as many again, but leave the total a minute fraction of the ICI Group personnel. This is as it should be: not the least of our resources is the ability to develop management skills, and this is part of our contribution to the newer companies—and the countries they are in.

Each subsidiary company overseas is directed by its own Board responsible to its shareholders, of whom ICI is the largest. As at home, most of the directors are generally senior executives of the company concerned, but where there is a public shareholding, there are also non-executive directors chosen for the experience and judgment they can contribute. Directors of ICI or the heads of the Territorial Departments in Head Office are generally appointed directors of the major companies, and act as a channel of communication between them and ICI.

Day-to-day management decisions are, of course, taken by the executives on the spot. ICI is consulted when important matters of policy are concerned and particularly when big capital expenditures are proposed: not only because as shareholders we must put up our share of the investment, but also because the Divisions in the UK are able to give invaluable help and advice on new projects in their fields. The contribution made by Divisions to

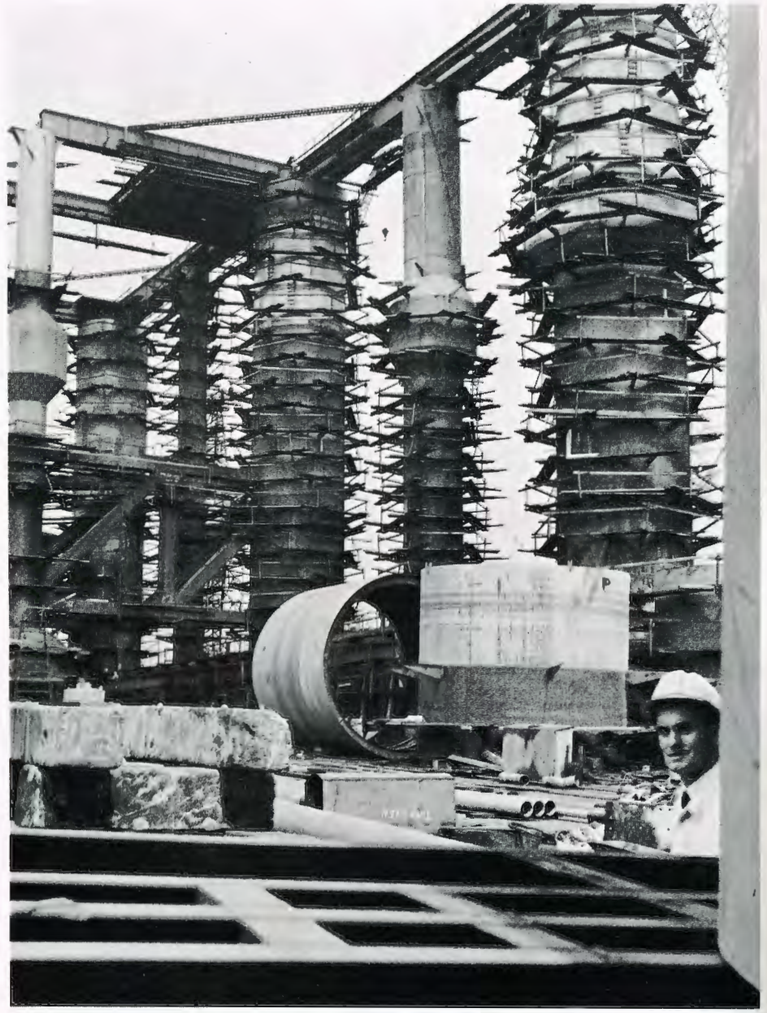
(*Continued on page 165*)

THE "OCEAN PRINCE" by Philip Reilly

Some time early in November, all being well, the *Ocean Prince*, the first ocean-going oil drilling rig of its kind to be built in Britain, will leave the shelter of the River Tees to join the North Sea search for oil and natural gas. It will be employed on behalf of a consortium formed by ICI, the Burmah Oil Company and two American companies, the Murphy Oil Corporation and the Ocean Drilling and Exploration Company.

The *Ocean Prince*, as a glance at an illustration will show, is of a very unusual design. None the less, she was to her builders a ship, "Ship No. 1279," in fact. Later the rig was described as a "semi-submersible mobile barge," but neither of these descriptions gives any idea of either the shape or size of what is really a giant island of steel, 365 feet long, 300 feet wide, more than 160 feet tall and containing more than 6000 tons of steel. Nor do they give any impression of the complexity of the rig, with its derrick for drilling wells to a depth of 20,000 feet, its working deck of almost an acre in extent, its landing platform for the helicopters which will fly visitors, mail and special supplies out from the mainland, or its well-fitted living quarters for 52 men.

The *Ocean Prince* has cost about £2m. and was built at the South Bank, Middlesbrough, yard of Smith's Dock Company Ltd. It was launched in July by Lady Holroyd, wife of Sir Ronald Holroyd, a Deputy Chairman of ICI, and is to be operated in the North Sea by ODECO (UK) Ltd. This is a company which was formed for the purpose by ICI, Burmah Oil, and the Ocean Drilling and



The "Ocean Prince" under construction. Photograph taken in June showing the elevation of the starboard side

"Ocean Prince" enters the water from the two parallel slipways on which it was built

Exploration Company of New Orleans, a subsidiary of Murphy Oil and a pioneer of offshore drilling. Ocean Drilling and Exploration have had extensive operating experience in the Gulf of Mexico, where general weather conditions are kinder than in the North Sea but where each year hurricanes can bring winds of up to 150 miles an hour, and they have applied lessons learned there, the hard way, in designing the *Ocean Prince*. The only comparable structure in the world is their *Ocean Queen*, which was commissioned in the Gulf of Mexico last June and on which different construction methods were used.

When the rig leaves the Tees it will be towed by tugs to one or other of the 26 areas of the North Sea, each of 100 square miles, where the ICI/Burmah consortium has been given permission by the British Government to explore for oil and gas. These cover a wide spread of the UK section of the North Sea shelf, from areas off the coast of Norfolk in the south to large groupings or "blocks" of areas on a line almost due east of Edinburgh and the Firth of Forth.

Safely launched, "Ocean Prince" is moved by tugs to the fitting out yard

In depths of up to 100 feet of water the whole structure can be lowered on to the sea bed by flooding the four horizontal parallel steel tubes, each 22½ feet in diameter, which form the main hull and from which vertical columns are built to carry the drilling derrick and deck areas. Even in 100 feet of water the main deck will be well above sea level and should be clear of the waves in the heaviest of storms.

In greater depths of water of as much as 600 feet, the *Ocean Prince* can be partially submerged by part flooding of the main tubes so that about 80 feet of the structure is below sea level. It will then be held in position by specially designed 10-ton anchors laid from each corner of the rig and held by steel chain cables 2000 feet long.

Because so much of the structure will be submerged to depths where there is very little wave movement, and because of novel design factors, the rig should prove a virtually stable platform for drilling even in heavy seas. This is of vital importance if operations are to be continued through the sort of storms which sweep the North Sea in winter—and sometimes even in summer—and the ODECO designers of the rig are confident that it will be achieved. They point to the experiences of another of their rigs, the older *Ocean Driller*, which in 1964 was caught in the eye of one of the most destructive hurricanes ever to hit the Gulf of Mexico. Winds estimated at 150 miles an hour and waves 60 feet high battered the rig, which was of an earlier design than the *Ocean Prince*, and only rarely did they cause rolling or pitching of more than two degrees. In an earlier hurricane, with winds of about 90 miles an hour and waves 35 feet high, pitching and rolling never reached as much as one degree and heaving, or vertical motion, did not exceed five inches.

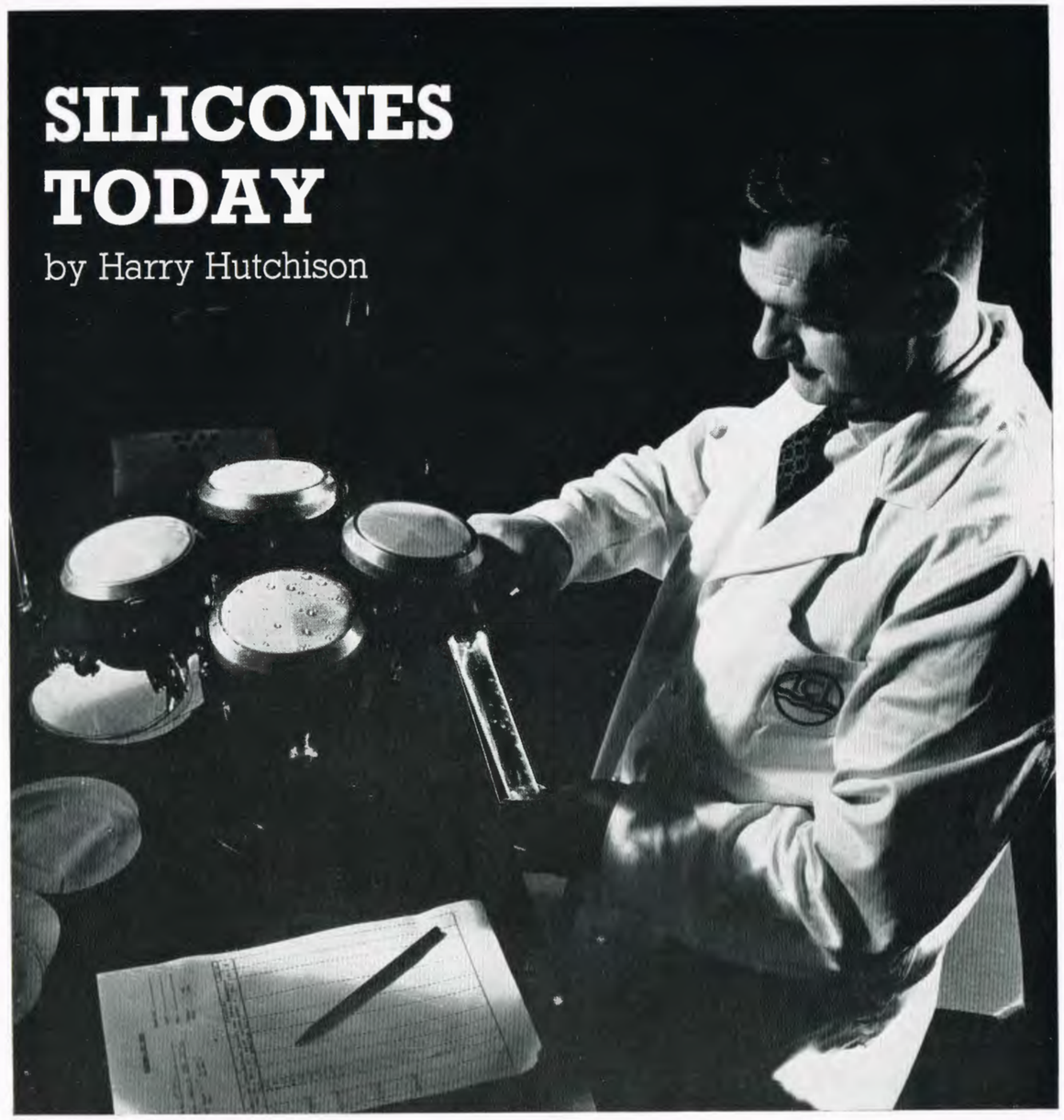
Map showing the approximate positions of the "blocks" awarded by the British Government to the Consortium for exploration

Freedom from rolling, pitching and heaving will be welcomed by the men who will live and work aboard the *Ocean Prince*, but even if the rig does not move with the waves the crew know that for much of the year conditions are more likely to be unpleasant than otherwise. The Americans among them, who are the drilling specialists, are well used to working in places where the weather can be suddenly violent but are accustomed to generally higher temperatures, and for most if not all of the British who make up the rest of the work team this will be their first experience of working on a rig anchored well out to sea. Not that the life aboard will be without its compensations. The work will be hard; but it will be well paid, there will be regular spells on shore, there will be no shortage of food cooked in the well-equipped galley, and there will be visits by the helicopter with mail and supplies.

The main supply base for the operation will be at Middlesbrough, but the administrative headquarters will be at Scarborough, in a former hotel on the Esplanade. There the progress reports will be received from the *Ocean Prince* by radio telephone, and there the decisions will be taken as to where it shall drill, when it shall be moved, and how long it shall stay in one spot. No one can tell what the drilling crews will find—if they could, the North Sea search would be a certainty and not the multi-million pound gamble it is—but whatever happens the searchers will have been helped by having the best equipment possible, and a rig specially designed for the job.

SILICONES TODAY

by Harry Hutchison

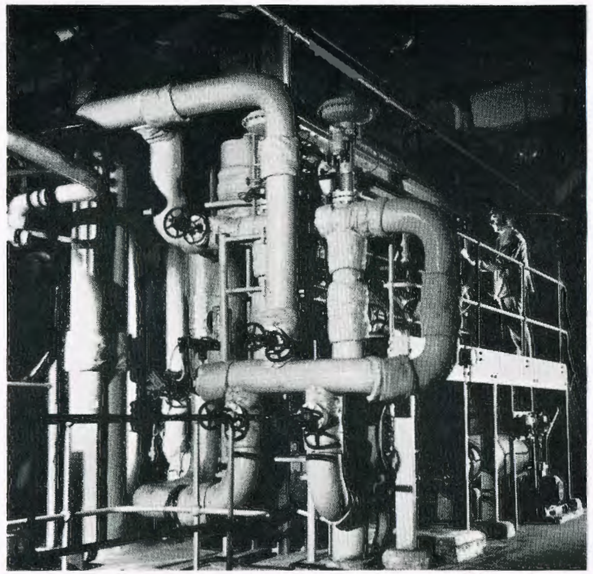


Textile materials treated with silicones are being tested on the Bundesmann apparatus. Circular pieces of fabric are placed over cups which then rotate. Meanwhile the surface is exposed to a simulated rainstorm. When the storm is cut off the state of the fabrics is examined. Water runs off the silicone proofed fabrics but untreated fabrics become sodden and the moisture penetrates to be caught in the cup below

It is not what they are but what they do that makes the silicones so important. "The magic silicones," "the versatile silicones," "the secret servants"—such descriptions are as apt today as they were fifteen or twenty years ago. It is, however, no longer correct to describe silicones as a new family of man-made chemicals, for now the older members have grown up, attained their industrial majority, and are mature commercial products.

Year by year new silicones join the family, and as their laboratory-bred qualities fit them more precisely for particular tasks, the older, ruder members of the family are replaced. The technology of silicones usage increases as their versatility is appreciated by more and more industries.

World demand for silicones expands, and the recent decision to build extensions to the plant that will give new capacity of 5000 tons per year at Nobel Division's Ardeer factory shows the Company's confidence that this growth will continue at an accelerating pace. The anticipation is confident because silicones that can tame foam, repel water, prevent sticking in moulds, give exceptional



A section of the Silicone Plant at Ardeer

electrical advantages, yield rubber-like materials that will be efficient in extremes of heat and cold, are worthy of the greatest respect. With them many hitherto intractable problems have been resolved, and the answer to many new problems will be given by existing silicones or by new ones that are even now being evolved and evaluated in research and technical laboratories.

In Britain last year over 2000 tons of silicone products were consumed; these products differed in their nature and formulation, but all shared the combination of characteristics that distinguish an unusual family of fluids, rubbers, resins, greases and emulsions.

Silicones have entered the home. Most furniture polishes contain some silicone fluid that makes the housewife's task of rubbing out easier and encourages the spread of the wax to give a thinner, glossier and brighter skin. Much rainwear is treated today with silicones to give outstandingly effective showerproofing. The silicone fluid is fixed on the fibres of a fabric but does not seal the pores: when rain falls on the garment the droplets stay on the outer surface and can be shrugged off. Such protection is comfortable because the pores of the fabric are not closed and consequently it can "breathe," eliminating condensation on the inner surface. Although it is not always revealed that silicones are the showerproofing agents in these materials, there is a welcome trend to give this information to the public.

Many garments now in the shops have labels sewn inside indicating that ICI silicone treatment has been applied, and swing tickets on a garment tell that the cloth from which it is made has passed stringent quality control tests in the Stevenston Technical Service laboratories —tests such as the Bundesmann, which exposes a portion of the proofed cloth to a simulated rainstorm of tropical intensity.

Britain must necessarily be interested in rainwear, so it is easy to understand the increasing use of silicone fluids by the textile industry. The new fashion materials—the foam-backed fabrics—benefit from silicone proofing. Light and warm though they are, foam-backed garments would not be satisfactory in rain were they not showerproofed. Indeed, the polyurethane foam backing would act as a sponge, with damp discomfort for the wearer. By treating the outer fabric with silicones it is made water repellant.

For such reasons the textile industry ranks high in the list of silicones consumers, although the tonnage needed in a year is small compared with the tonnage of man-made and natural fibres that go to clothe the nation. This is so because with silicones a little goes a very long way.

In Britain the largest consumer of silicones is the electrical industry, in which different types of rubbers, fluids, resins and greases are employed. Other large applications of the products, besides the important textile usage, include polyurethane foam cell-control, treatment of moulds to secure easy release of contents, treatment of paper to give an anti-stick effect, and anti-foaming treatment which increases process efficiency in many industries.

Silicones are not easy to manufacture, but as time goes on the production of "tailored" silicones for particular purposes becomes more refined. ICI silicones are made by reacting Mond Division's methyl chloride with the element silicon, imported from countries that have cheap electric power. When these substances are reacted four types of methyl chlorsilanes are formed and separated in distillation columns. From them the main silicones are made after further processing and intricate manipulation.

Silicone fluids, depending on the control exercised, can be as free-running as water or lazier and much more viscous than treacle. An enormous number of different things can be done with silicone fluids themselves, but the highly viscous fluids, or gums, with a filling agent and a curing agent added, can be turned into silicone rubbers. When these mixtures are heated the curing agent causes profound changes in the fluid, which then assumes new rubbery characteristics.

The silicone fluids in different viscosities have qualities that commend them to different industries. Their importance in the polish industry and in the showerproofing and finishing of textiles has already been mentioned. Packed in aerosols, silicone fluids in solution or emulsion can be sprayed into moulds to ensure that the components shaped in the moulds will be easily removed without blemish caused by sticking. A few parts per million of certain silicone fluid emulsions are most effective foam-control agents in dye baths and in other industrial processes that are troubled by foaming.

Paper treated with silicone fluid resists adhesion to sticky substances. Consequently silicone-treated paper linings in sacks that are designed to hold sticky substances are effective and labour saving. Silicone-treated paper is also increasingly employed as the readily detachable backing from materials sold with self-adhesive surfaces.

Perhaps most important of all fluids is the polyurethane foam cell control agent 'Silcocell' — evolved by ICI research in Dyestuffs and Nobel Divisions. Very small quantities of 'Silcocell' used in the polyurethane foam manufacturing process

Lengths of the 'Flexel' heating element are fixed to the joists of a new house. Above is a 2 in. thick insulating blanket of fibreglass. When the house is being completed the ceiling board is placed in position and nothing of the heating element can be seen

control the size of the cells in the foam and give a reliable standard in manufacture. This use is quite distinct from the employment of special silicone fluids to impart showerproofing quality to foam-backed textiles.

The resins are peculiarly interesting for the electrical trade because their insulation properties are so outstanding that major alterations in equipment and design, with increased efficiency, are possible. In this industry the resins are also used for bonding, laminating and impregnating purposes.

A silicone resin release-agent achieved some celebrity last year because with it the inner surface of the stainless steel Denby Dale pie dish was treated to prevent the succulent contents from sticking to the sides. In the baking industry such resins are used for coating the inside of pans to secure easy release of bread and cake from tins and the like. Silicone resin solutions in volatile solvents, sprayed on the dry outer surface of masonry, give invisible armour to repel rain. At the same time the pores of the stone and brick are not sealed, so the building can continue to "breathe" and condensation on inner walls is avoided.

Silicone rubbers maintain their flexibility at low temperatures when ordinary rubber would become rigid and brittle and at high temperatures when it would

In a Nobel technical service laboratory a technical man is encapsulating delicate electronic equipment in silicone rubber. The 'Silcoset' rubber used cures at room temperature and when it does so the electronic equipment is completely insulated and protected

char. For these reasons the silicone rubbers are preferred where extremes of temperature are encountered. The rubbers are used in cables for naval vessels and for the aircraft industry, for moulding and extrusion, and for sleeving some electrical installations. Because silicone rubbers are chemically inert and do not deteriorate at comparatively high temperatures they are well suited for making flexible blood transfusion tubing. It is easily possible to sterilise such tubing in boiling water, so enabling it to be used many times, whereas conventional rubber would perish.

Silicone rubbers do not have the same mechanical strength as natural or synthetic rubbers, and much research work has been done to improve this quality. Many different fillers have been examined, including carbon black, and their effects measured. As an unexpected result of this work in Nobel Division research the idea for the 'Flexel' heating element was born. 'Flexel' is made by coating glass-cloth or other materials with a thin film of silicone rubber that has been made conductant by admixing carbon black during earlier processing. When simple electrodes are stitched along each side of the product and current is passed through, the entire surface heats up to a level, constant temperature that is easily maintained without overheating.

Several possibilities have been tried out, including the use of the new material as the heating element in electric blankets or in thin panel-type space heaters. Several heaters with 'Flexel' elements made by different companies are now on the market, and at least one company is developing a 'Flexel' heated blanket.

It was realised, however, that by far the biggest potential use was in space heating, and in a joint study with the Architectural Research Unit of Edinburgh University it was found that heat distributed by radiation from a large-area low-temperature surface was a most comfortable way of keeping people pleasantly warm. Now the 'Flexel' space heating system has been tried out experimentally in local council houses using the principle of a heated ceiling, and there is much interest throughout Britain. The system is simple.

The 'Flexel' element insulated in a 'Melinex' envelope is either fixed to the joists before the ceiling board is put up or, in an older existing building, the element is laid between the joists to rest on the upper surface of the ceiling. When this is done some two inches of thermal insulation is placed above the 'Flexel.' People in 'Flexel' heated houses are enthusiastic about the comfort and simplicity of the system. This is not surprising, for the ceiling acts as a large panel radiator that beams its warmth downwards and evenly to every part of the rooms.

THE CHAIRMEN OF DIVISIONS

Mr. J. D. Rose *of Paints Division*

At six foot two and a bit John Rose gives the impression of being even taller than he is. He holds himself well, but there is something loose and supple about his frame and his walk which seems to accentuate his height. To a practised ICI observer, the fact that he is a former Dyestuffs Division man would probably be apparent—he has the typical Dyestuffs distaste for humbug and affectation, and the typical saltiness, or earthiness, of humour.

His Dyestuffs background one feels to be an important factor in his make-up. Joining that Division's Organic Research team in 1935, he became Research Director, and for one year Production Director, before transferring to Paints, where he became Joint Managing Director before succeeding as Chairman about 18 months ago. Work in the Research Labs—work at the bench—thoroughly suited his temperament. It satisfied two predominant strains in his character—his intellectual curiosity and liking for experimentation and his impulse to do something creative with his hands. Mr. Rose, in fact, had thoughts when he was young of being an artist and attended an art school for many years, but a day came when, with admirable objectivity, he decided that he had not the necessary talent. He then turned his attention to chemistry. The bench offered him, as well as the exercise of his professional ability, an outlet for that skill of eye and hand which had first impelled him towards an artistic career. One senses in talking with him that he misses the lab and the bench and has to find other outlets for that still powerful itch to find something skilful and exacting to do with his hands—which now has to content itself with such things as repairing almost anything, building greenhouses and laying concrete.

He cannot endure long-windedness and can usually be trusted to cut by half any report or paper served up to him as a draft. The positively surgical skill with which he will pare and lop-off redundant words and expressions is traceable back to his early professional days, when, to augment a decidedly modest starting-income, he used to undertake abstracting work for the Bureau of Abstracts. This was a pastime which became a habit—so much so, in fact, that he has on occasions been accused of reducing a report to the compass of a telegram!

He was further aided in this work by having a thorough knowledge of German and a respectable familiarity with French and technical Italian, for the most part acquired after he left Oxford and went for a year on a Fellowship to study chemistry at Zürich.

One might wonder how such a man, steeped in the atmosphere of such an intensely technical Division as Dyestuffs, would make out in one so differently orientated as Paints. For the Paints business, apart from the fact that both have an interest in colour, is as dissimilar in structure and operation to that of Dyes as it is possible to be, the former being principally a marketing organisation, with its main commercial focus upon meeting the needs of the motor industry and decorating trade, the latter with an open arena of ever more complex technical invention and adjustment.

In fact Mr. Rose found himself as much at home in the one as in the other, since—apart from the fact that the research side of the Paints business has been extending its horizons considerably—questions of personnel policy, the tremendous expertise necessary to selling, and the greatly increased spread of information about the workings of the Division (resulting in people being less compartmentalised and more broadly based than formally) have kept his responses fully in training!

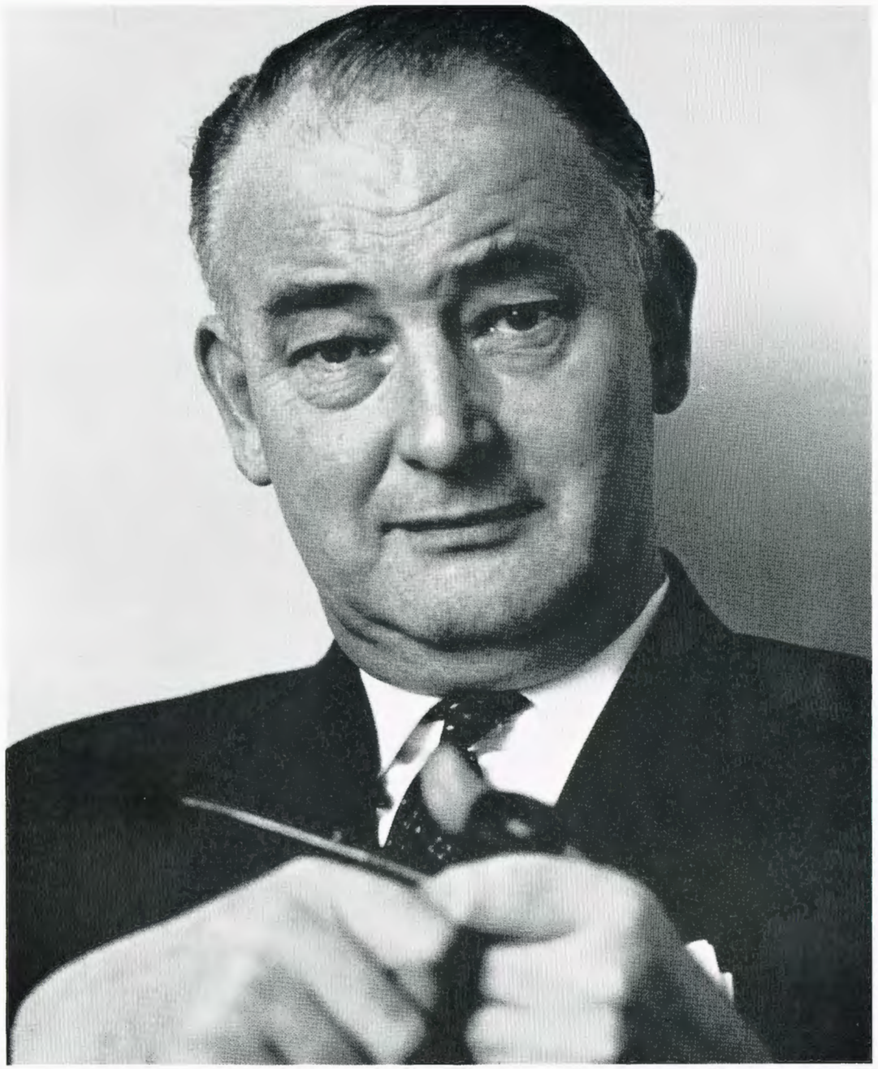
Mr. Rose sees a Division chairman's first concern as being to strengthen any links in his Division which may appear to be weak. Aside from this, the job has both its short term and its long term aspects. Sales, for example, are of immediate as well as of perennial concern, while Research may be called long-term. A chairman has to keep everything in phase and to do his best to see that individual talent is given its optimum chance to develop within the overall framework of the common good. He believes that in order to be a good chairman it is first necessary to be a good colleague.

Paints Division of recent years has, of course, became much interested in the wallpaper business. The paints industry proper is expanding only slowly since, although more houses are being built, wallpaper is gaining on paint for internal decoration, and in industrial use modern techniques of paint application are much more economic than of yore. Electrostatic painting, as an example, now common in industry, uses only a third as much paint as the previous spraying treatment. And although ever more motor cars are being produced, their size is always diminishing!

The public, though ever more colour conscious, takes little interest in the technical background to the industry, and in consequence paints do not make headlines. None the less, very considerable technical advances have been and are being made, and while the experts do not foresee any revolutionary developments, and the largest growth prospects may well be on the wallpaper and Hyde sides of the Division's business, background advances and economies will continue, and the Division takes pride in the fact that two of the inventions it has pioneered have been bought for use in the United States.

John Rose is a Yorkshireman by birth, and once a Yorkshireman always a Yorkshireman. Despite having spent more or less the whole of his working life in Lancashire and the South, he never fails during the cricketing season to look first in his newspaper to see how Yorkshire are doing.

He is average-keen on sport but plays little himself nowadays. When young, skiing was his favourite, but he says he is now too old. Golf bores him (why spoil a good walk?), and he gets little practice, with a 1½ acre garden clamouring for his attention at home. As a concession, though, to the god of exercise he has no seat to his motor lawnmower, which, as it is exclusively tended and maintained by himself, is a lively enough performer and keeps him well on his toes. With a blend of apology and bravado in his voice he will tell you that he has never in his life been to a professional soccer match!



photograph by Philip Jones Griffiths

Like the rest of his colleagues who are Division chairmen, John Rose finds that there are not enough hours to the day. Paints Division is a very social one. There is an incessant stream of visitors, many from overseas, and a large number of social occasions within the Division itself. It is also a friendly Division. Relationships at all levels are cordial. But exacting as are the calls made on a Division chairman's time in just doing his job as chairman, there are, inevitably, many others which are, as it were, extra-mural. Head Office conferences and committees, panels, investigations, and a host of other things which are of concern to the Company as a whole, fill up his diary. In addition, he serves on a committee of the Chemical Society and is a Freeman and Liveryman of the Salters Company, for which he has a deep regard.

His old love of drawing is shown, perhaps, in the beautiful Dürer facsimiles which grace his office walls, and in his personal choice of pictures for the reception rooms in Duffield House, where the Division entertains its guests and visitors.

When he can find time—usually around bedtime—he is fond of reading. He reads omnivorously—history, biography, science, thrillers, anything. Driving is, as one would expect, a favourite exercise, calling as it does for a concert of head and hand.

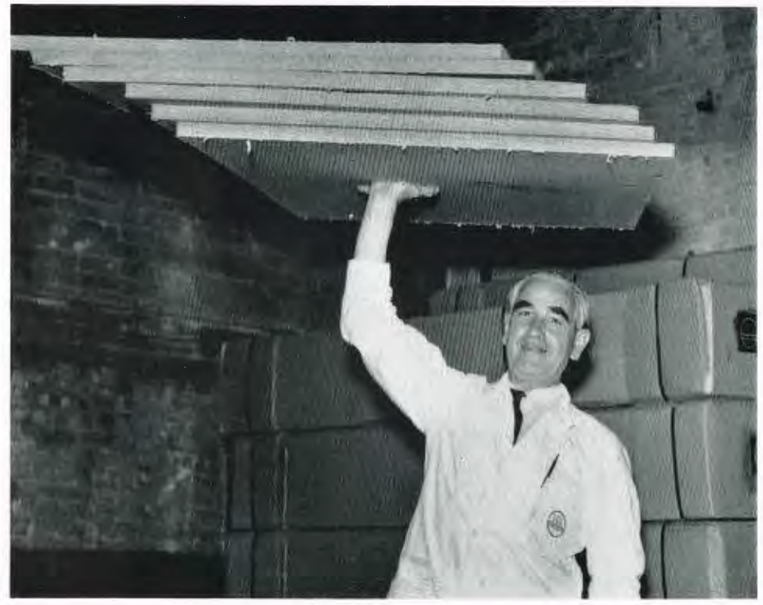
The only serious difference of opinion he has within his family circle is that, like many another whose working and waking hours are one and the same, his own idea of a really good holiday is to stay at home!

People & Events

ICI stock issue success. *Counting loan stock applications on 7th September at Barclays Bank, one of the four banks handling ICI's £50 million loan stock issue. The total subscription, which broke all City records, exceeded £1,052,000,000 stock, of which 142,000 applications for a total in excess of £765 million were from ICI stockholders*

Scottish nylon project. *Seated behind a model of the giant £31 million nylon plant to be built by Dyestuffs Division at Nobel Division's Ardeer Works in Ayrshire are directors of Dyestuffs Division who attended a special press conference in Glasgow on 25th August. Standing is Dr. John Holm, Chairman of Nobel Division, who opened the conference, and on his right is Dr. Alan Robertson, a deputy chairman of Dyestuffs Division. When completed, in 1967, the new plant will provide permanent jobs for 1100 people, including about 60 university graduates*

New building product. *This picture was taken to illustrate the extreme lightness of 'Purlboard,' a new building product developed at Billingham, which is to go into large-scale production next year in a new plant at Heysham in Lancashire. 'Purlboard' is so light that just over a ton of it will fill a 15-ton lorry and is sufficient for the ceilings of 30 houses*



BBC 2 at Darwen. *The abolition of clocking on and off for payroll workers at Plastics Division's Darwen Works, which was introduced gradually from* 1961, *attracted BBC television cameras to the works on* 11*th August to film and interview factory employees. The film is to be used as part of a programme entitled "The Colour of Your Collar," to be televised in November in the BBC2 series called "Shop Floor." The four Darwen men facing the TV cameras in our picture are (left to right) Messrs. D. Knowles, J. Heys, J. Walkden and J. Walsh*

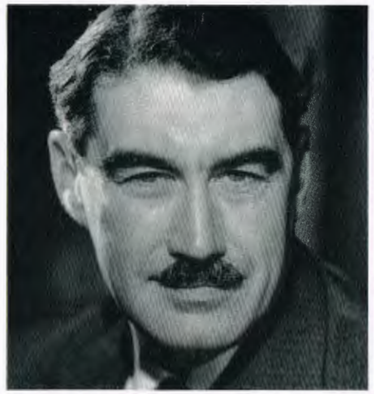
Gala Day. *Concentration during the sack race, one of the sporting events at ICI Fibres, recent gala day at Harrogate which was attended by more than* 1000 *adults and children. Besides races for all age groups, there were donkey rides, a miniature railway, roundabouts and numerous sideshows*

Productivity Conference. 600 *employees from all levels of Imperial Metal Industries Ltd., an ICI subsidiary company, attended a conference on productivity organised by IMI and held at Witton on* 12*th August. Speakers included Mr. Austen Albu, Minister of State, Department of Economic Affairs, Mr. Duncan Dewdney, a deputy chairman of the National Prices and Incomes Board, and Professor Henry Phelps Brown, of the London School of Economics*

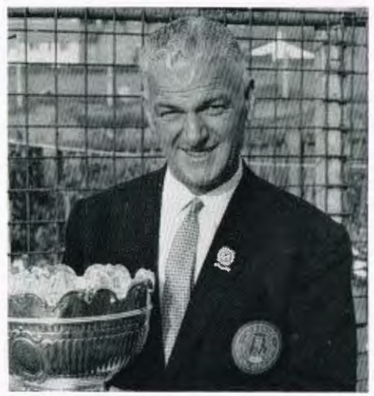
Fijians at Bakewell. *Members of the Fijian Army Band, who gave a special display at the Bakewell (Derbyshire) Show on* 5*th August, were photographed on the Mond Division stand there with Mr. F. J. Byer (left) of the Shrewsbury Sales Office, Miss F. M. Greaves, Lime Group Distibution Manager, and Mr. R. Cree of the Manchester Sales Office. Later in the month the Fijians visited the Edinburgh Festival, where their display proved one of the highlights of the Tattoo*

'Crimplene' in Paris. *High necklines in polo or stand-up styles, slender silhouettes and a return to rich cocoa-brown colours were features that ran right through the French Collections. This dress by Balmain, one of several 'Crimplene' models in the Collections, combines all three. It is in brown drip-dry, crease-resisting 'Crimplene' cloqué with bands of navy piped with white at neck, wrists and waistline*

Guess my height. *A highlight of the village fete at Dodford, Bromsgrove, Worcestershire, was this inflatable figure over* 20 *ft. tall made from* 500 *gauge black 'Visqueen' film, used for a guessing-the-height competition. The "giant" was put up by Mr. B. R. Burley, 'Visqueen' representative in the area, in aid of funds for the village church. (Photo by kind permission of the "Bromsgrove Messenger")*



New ICI solicitor. *Mr. J. S. Copp, a solicitor in the Head Office Legal Department since 1947, has succeeded Mr. J. W. Ridsdale as ICI Solicitor on the latter's retirement*



Bowls titles. *An Ardeer driver, Mr. John Hershaw, won the Scottish Bowling Association's single hand championship held at Glasgow on 7th August, and followed this on 11th September by winning the British Singles Bowls Championship*

Half-century. *Mr. John Coley, a night watchman at Mond Division's Buxton Works, completed half a century's service with the Company on 24th July. He is the second member of his family to achieve this distinction—one of his brothers having completed 51 years before he retired four years ago*

RETIREMENTS

Mr. J. W. Ridsdale

Mr. J. W. Ridsdale, the Solicitor to the Company, retired on 30th September after more than 37 years' service. Sir Ronald Holroyd, one of ICI's Deputy Chairmen, writes:

Jack Ridsdale joined the Company in 1928 as an assistant in the Legal Department and has had the experience, rare in ICI, of remaining in the same Department for all his 37 years of service. He succeeded Eric Bingen as ICI Solicitor and Head of the Legal Department in 1951.

Mr. Ridsdale's intimate knowledge of ICI agreements with subsidiary and associated companies and the history behind

them, his shrewd judgment and his capacity for hard work, have been invaluable to the Board, especially during the last 15 years during which the legal aspects of the Company's affairs have become increasingly complex. He was very much involved in preparing the Company's defence in the Trumper case, and in 1954/5 he played an important part in settling the legal details of the dissolution of the old CIL company following the judgment in the US Anti-Trust suit. It was probably this latter experience which convinced him of the need for ICI Legal Department to think internationally. To this end he took steps to see that members of his Department became proficient in foreign languages as well as in the laws of other countries.

Jack Ridsdale's duties brought him into close contact with many aspects of the Company's business, and this has enabled him to ally a good deal of financial and commercial knowledge with his legal expertise. It is this breadth of experience, coupled with his own friendly personality, which lies behind his reputation for helpful collaboration amongst so many ICI people both in Divisions and in Overseas Companies.

Outside work, Ridsdale's passion, if one excludes boiled sweets and port, is for ocean-going yachting, and it is understood that he is planning shortly to sail a boat to the West Indies. His many friends will want to offer him their best wishes for this venture and for his continuing health and happiness in his retirement years.

OBITUARY

Mr. J. E. James

It is announced with deep regret that Mr. J. E. James, who was secretary of the Company from 1929 until 1944, died on 7th August. He was 89. Mr. R. A. Lynex writes:

"Jimmy" James was a first-rate lawyer with a passion for essential detail; his thinking was as clear as crystal and never tortuous. After the 1914/18 war he left private practice as a solicitor in the City to become secretary of the United Alkali Company in Liverpool and in 1927 was appointed an assistant secretary of ICI soon after its formation. In that capacity, and subsequently as the secretary of ICI (the third holder of that office), he made a valuable contribution towards establishing and developing the Company's administrative machinery, particularly in its early years; and it is right to record that many of the ideas that his sterling qualities enabled him successfully to introduce within his field have stood well the test of time and still remain enshrined in the Company's administrative structure.

A hard, determined and thorough worker in all he undertook, James never spared himself; yet to those who strove to work as he did, he invariably showed much thoughtfulness and patience. He was outspoken and fearless in argument, and loved to take up the cudgels on behalf of those whose rights or feelings he believed were in danger of being overlooked or treated with scant justice. To some, no doubt, on a first approach he could appear formidable; but his nature was essentially cheerful and kindly, and his whimsical sense of humour was a catalyst as well as a tonic; those who worked at close quarters for him, and most of those who worked with him, sooner or later came under its spell and became devoted to him. Many are the younger men who must have profited immeasurably by their association with him, his criticisms of their efforts, and his guidance. There is room for many such men; they leave their pleasant mark on others in various ways that they themselves, maybe, would least suspect. John Egbert James was an admirable man, who in the course of a long and useful life endeared himself to many and must have been deeply respected by all who knew him. Such a staunch friend will be long remembered with affection.

ICI OVERSEAS (continued from page 151)

the strength and development of the overseas companies, for which they have as a rule no direct responsibility, is enormous, and is gratefully recognised overseas as well as by the ICI Board.

Clearly, however, ICI as the parent company has something more to do than help in the direction of its existing companies. If we are to ensure that our investments are soundly based and well directed, if we are to have a thorough knowledge of the changing economic and political climate of the countries where we have export markets and manufacturing or selling companies, or where opportunities for export or manufacture might arise, we need an expert staff to deal with the daily flow of problems—enquiries, proposals, conflicts of interest, staffing requirements, representations to our own or other governments on tariffs or trading regulations, negotiations that cross Division or Company boundaries, investment queries, and so on—and with the reports the Board requires on overseas activities and prospects.

This is provided by the Overseas Departments, whose functions, though more precisely defined, are not much altered by the recent reorganisation. There are eight departments, each under a Territorial Head, with responsibility for defined areas of the world which they are expected to know well and visit regularly. Over them is the General Manager—Overseas, with the general responsibility of helping the Territorial Directors to formulate overseas policy and to review our investments and the performance of the various overseas companies. He is also required to advise on succession and appointments to senior posts overseas, and in particular to provide the secretariat for the Policy Groups of the Board and to supervise the ICI overseas selling companies. In carrying out his duties he is helped by a small senior staff and by the Territorial Heads, who of course often go directly to the Territorial Directors on specific problems.

Finally, there is the organisation at Board level. As ICI's overseas activities have grown, so has the number of Directors concerned with them; and in the reorganisation last year it was concluded that to supervise our world-wide interests and to ensure that we increased our share of international trade it was desirable to have six Territorial Directors, one of whom would act as a general co-ordinator of policy and deal with things crossing territorial boundaries. Finally, for each major overseas manufacturing company or group of companies there was established a Policy Group consisting of a Deputy Chairman and two or three other Directors, including the Territorial Director concerned, with the General Manager—Overseas, which will meet at least once a year with the Chairman or chief executive of the overseas company and his senior colleagues. It will be their task to get a full understanding of the policy and plans of the companies concerned, to advise them on ICI's own policies and interests, and to maintain the mutual understanding and the unity of purpose which is the strength of the ICI Group.

ICI (Europa). *The first meeting was held in the Boardroom at Imperial Chemical House, Millbank, on 16th September of the Board of ICI (Europa), the new organisation which has been formed to replace the European Council and which will supervise and co-ordinate ICI's selling and manufacturing activities in Western Europe.*

Mr. E. J. Callard (fifth from left), the ICI Main Board Director responsible for Western Europe and chairman of ICI (Europa), presided at the meeting. Others present were (from left to right) Mr. F. C. Bagnall, ICI Commercial Director; Mr. M. A. E. Hodgson, a deputy chairman of Heavy Organic Chemicals Division; Dr. E. B. Abbot, managing director of ICI (Fibres) Ltd.; Mr. T. E. Smith, secretary; Mr. D. M. Bell, Chief Executive of ICI (Europa); Mr. E. Hodgkin (Overseas Dept.), Mr. J. H. Townsend, general manager—Control Groups; Mr. R. S. Wright, chairman of Agricultural Division; Mr. D. H. Carter, chairman of Mond Division; Mr. E. G. Williams, chairman of Plastics Division; and Dr. C. R. Mavin, chairman of Dyestuffs Division

"A Plum of a Foreigner"

by R. J. Hatch

HMS Jamaica

ON 7th January 1949 the British cruiser *Jamaica* sailed from Plymouth (Devonport) to join the America and West Indies Station based on Bermuda. I was fortunate enough to be a member of her crew. As we drew away from the jetty on that January morning with the ship's band playing:—

"Now is the hour when we must say goodbye

Soon I'll be sailing far across the sea"—even though we were sailing on a commission which would mean that we should not see old England again for two and a half years, I do not think there was anyone among us whose spirits were not high at the prospect in store. The West Indies station was looked on as a plum—"A plum of a foreigner"—if you were jammy enough to be drafted to it.

At that time, a ship on the West Indies station did four long cruises during her period of commission, visiting ports on each of the four coasts of the Americas. On the outward voyage the weather was vile, and not only could we not carry out any working exercises, as is customary at sea, but I was seasick for the only time during our whole commission. However, we reached Bermuda at 2 p.m. on the 17th, where our captain made various ceremonial calls on the admiral, the governor and so forth, and a number of sports teams were landed and libertymen piped ashore.

One or two small defects in the ship which had made their presence felt on the voyage were attended to in the dockyard, and then, on 25th January, we were off again for our namesake island, Jamaica itself.

The ship, as might have been expected, received a boisterous welcome when we reached Kingston on Saturday the 29th. A reception ceremony in its honour was quickly laid on, attended by all the local big-wigs, addresses of welcome were read and replied to, the ship's band played, the local police and military paraded, as did 150 of the ship's company, and all the normal courtesies were observed. Thereafter hospitality was informal—dances, sports, entertainments for the officers and the men—and I must say they made a very good job of seeing that we all enjoyed ourselves. Much the same occurred at Port Antonio and Montego Bay, at which they opened a night club to the ship's company, and 800 people visited us in one afternoon. Then it was back to Kingston again for a spell—all very pleasant and everywhere promoting "the tops" in good will.

As it turned out, this experience was an aperitif for our first and unfortunately last major cruise—to Chile, Peru and Colombia.

Meeting HMS Amethyst

After passage through the Panama Canal en route to Chile, the ship held the "Crossing the Line" ceremony, some of us finding that soft soap has several uses.

The first port we came to on our "west south coast" cruise, Valparaiso, appealed to me more than any other I have since been to. The sincerity of its people and the equable climate, make it a "natural" for wanting to settle there. Later on during the cruise, when we were at Callao, the ship's company were invited to a dance given by a local club. After the dance a friend and I were invited to "up homers" (a slang term for being guests of local people). At this time Peru was very much a police state, and on leaving our hosts' house we were arrested, as it had gone curfew. Fortunately my friend being born in the Falkland Islands could speak Spanish fluently. The police wanted us to sign a statement that the residence we had visited was undesirable, so that its occupants could be arrested. We were locked in a cell, guns pointing and big chief shouting and threatening. Non-catalogued descriptive words were our only weapon. Nearly at dawn they allowed us to leave without anything being signed.

Buenaventura must be the hottest and wettest port on earth: the rainfall is 350 inches annually, and we certainly had our share. Before returning to our base, Bermuda, we called at St. John, Antigua and Guantanamo.

World affairs at this time were certainly not any brighter than they are now. In China, Communists were fighting Nationalists, and one of our frigates, HMS *Amethyst*, was trapped up the Yangtze river, in consequence of which we were signalled to leave the West Indies Station for the Far East.

On 26th April, amidst a tumultuous farewell, we left with the band playing "On a slow boat to China." This was appropriate, as because of the distance involved we had to steam at economical speed. Apart from two hours' leave to each watch at Pearl Harbour, we never touched land until we arrived at our new base, Hong Kong, on 28th May. A hectic cruise to Japan followed, visiting the ports of Sasebo, Kure, Yokosuka and Kobe.

After returning to Hong Kong we heard that HMS *Amethyst* had escaped and were signalled to rendezvous. We met on 1st August, cheering ship as we passed her—a spine-tingling experience. All were proud to escort her back to the fleet.

A drab winter was spent in Hong Kong, relieved only by the Chinese New Year. I was pleased to receive, with some of my mates, an invitation from our Chinese tailor to dinner at his flat.

March 1950, the Fleet sailed for exercises, finally assembling in Subic Bay, Philippines, after which it dispersed and we went our various ways, HMS *Jamaica* to Jesselton, Borneo, where we had a most enjoyable visit before returning to Hong Kong. One of the means we adopted here to show our appreciation of the hospitality given to us was a children's party on board, complete with slides, roundabouts and sticky buns, which owing to a certain amount of disorganisation on the jetty was attended by some heavily bearded "infants" of anything up to 30 to 40 years of age!

On our return to Hong Kong an amusing incident occurred. We had on board a supply of frozen Australian rabbits, and one of our chefs was detailed to prepare them for dinner. The poor chap knew not what to do, for he sat outside the galley, muttering to all and sundry, amidst an ever-growing pile of fur, that it wasn't only plucking they needed!

Next stop was Ominato, Japan, almost due east of Vladivostock, where we did some hard work preparing sports pitches and a rifle range. During our return to Hong Kong thousands of birds migrating northwards were silly enough to seek sanctuary on a southbound ship. A falcon was among the many species, and a great bully it was. Firstly it attacked and ate an owl, then sat gloating on the mainmast head. After it had finished off a wagtail, public opinion was such that it was shot.

Before long we found ourselves at Sasebo, but under different circumstances to previously. The Korean war had broken out and we were one of the first on the scene. Our main task was to prevent the North Koreans from landing forces and agents south of the border (Lat. 38° North) and to give all the support we could to the South Korean forces.

Initially we picked our targets and had great success. On 2nd July four North Korean MTBs and three MLs launched an attack on us and USS *Juneau*. All the attacking boats were sunk and survivors picked up. At about this time the North Koreans were driving back the South Koreans, which for us meant heavy expenditure of ammunition against such targets as power stations, bridges, troop concentrations, lorries, block roads, etc. Retaliatory fire was poor and mostly out of range, but while we were bombarding a cliff road a shore battery opened up and a lucky shot grazed our after tripod, exploding and sending a hail of fragments on to the pom-pom deck, killing six men and injuring others.

Sasebo had become the main base for ships of all nations. Patrols were essential among mixed ships and nations. Libertymen on returning from shore used a particular section of a long, narrow jetty for each ship. The officer in charge of our patrol was not popular. On one occasion when he gave the command for libertymen to fall in, he turned for a second to speak to his petty officer and in a flash was pushed from behind, over the jetty into the water. A cry of "You fall in first!" followed him. When fished out, capless, bedraggled and white with fury, he demanded to know who had pushed him. Nobody had seen, of course.

The discovery of mines came as an unpleasant shock, some of which we blew up with gunfire. Our bombarding work was now being helped by the use of spotter aircraft, and it was not long before

The last rites: a burial at sea

Boxing at sea

Made to measure

Uniform optional: the children's section of a Japanese public swimming bath

we were to take part in the biggest campaign of the war, only this time it was very much on the offensive. It followed a little after my 21st birthday, which was spent at sea. The assault on Inchon started on 15th September. Our activities during this period can be summarised as follows: Over 1000 rounds of 6 in. shells fired, nearly 500 rounds of 4 in., and a few hundred short range at aircraft. Results achieved were: destruction of an ammunition dump (which exploded, a huge cloud of smoke drifting away from it for several hours), many enemy guns, emplacements, billets, lorries and tanks knocked out, besides minor hits on lines of trenches and buildings. We also shot down one enemy aircraft. Our casualties totalled three, and some minor damage. One of the planes which attacked us put an armour-piercing bullet through the back of a 1 in. armour plating turret, the man inside suffering a grazed leg!

I had my first taste of being closed up at action stations for a lengthy period and tasted for the only time "pusser's biscuits." (I was amazed when told they were for eating and convinced no bullet could go through that kind of armour plating.)

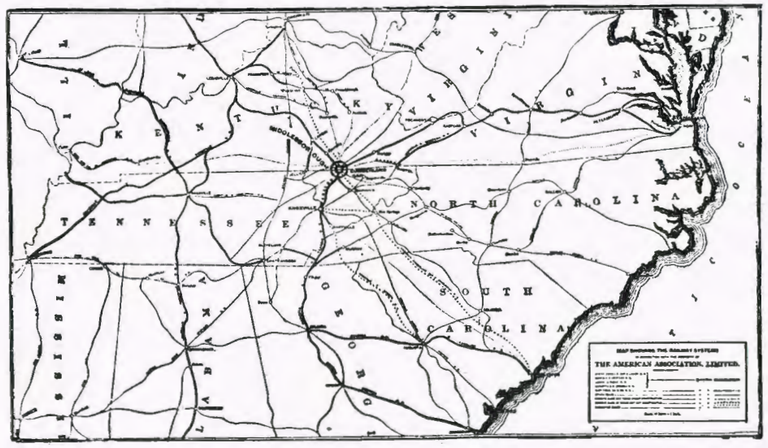
Jamaica made a few more patrols, then sailed to Singapore for a refit. While there we were transferred to a shore base, H.M.S. *Terror*, and enjoyed the amenities which shore bases offer; the reason no doubt why the band played our new signature tune, "Cigarettes and Whisky," when we finally cast off from the jetty flying our paying-off pennant.

Our voyage home allowed us a few days at Ceylon and Aden, then via Suez Canal, Port Said, Malta and Gibraltar, making Devonport in February 1951. We had circumnavigated the world, crossing the line twice and steaming 79,600 miles, also seeing some active service and having a very small supporting role in the glorious episode of the *Amethyst*—"a plum of a foreigner" indeed!

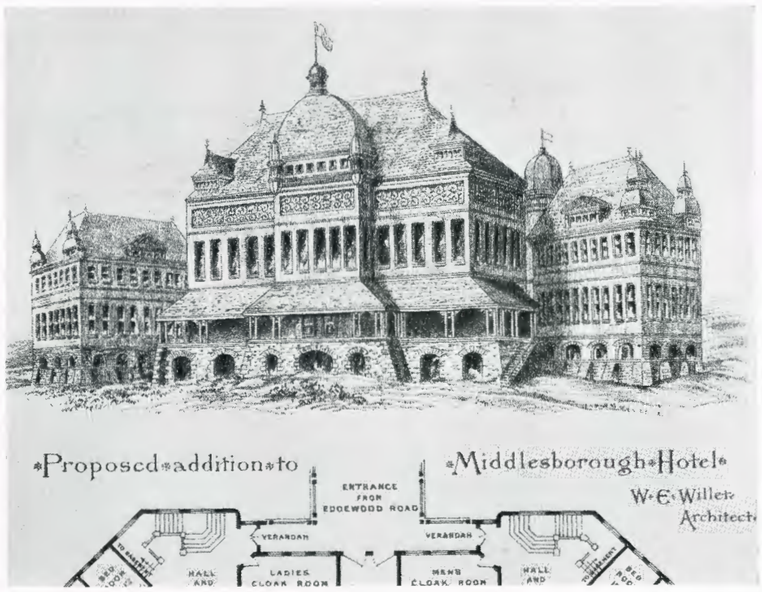
© R. J. Hatch, 1965

The Trail of the Lonesome Pine

by R. E. Jones



A railway map of the district



From a brochure of 1890 issued by the Middlesborough Town Company

U.S. Alt 58 is a pleasant highway which wanders through the Southern Virginian highlands towards one of the most dramatic and historical localities in America, Cumberland Gap, where Virginia, Kentucky and Tennessee all meet. The Gap represents practically the only break in the southern section of the great Appalachian chain of mountains, and it was not until it was explored by the intrepid Daniel Boone shortly before the Revolutionary War that news leaked to the east coast that there might be potential farmlands to the west beyond the wilderness. Up till that time, the Virginian mountains, heavily treed and inhabited by mountain lion and bear as well as by hostile Indians, had represented an impenetrable barrier to the westward flow of civilisation.

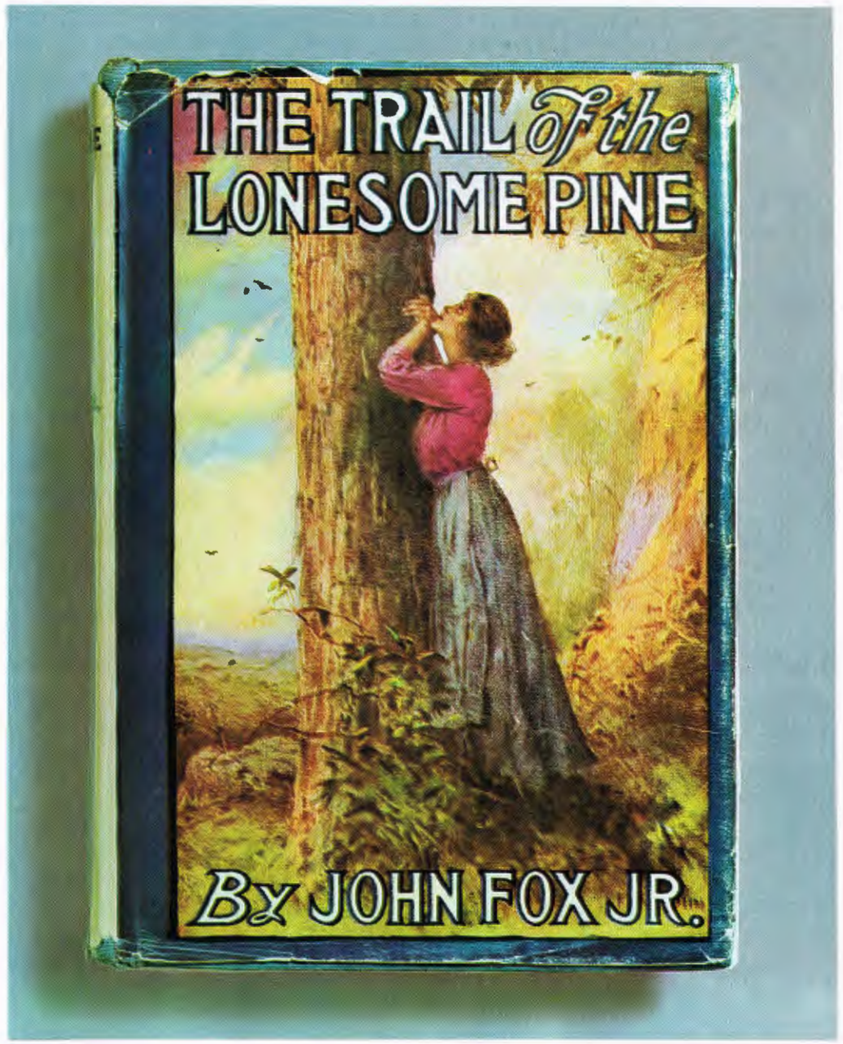
Boone antedated his fellow frontiersman, Davey Crockett, by about fifty years, and although the latter was to achieve immortality through his premature death at the Alamo, Boone was, if anything, the more formidable character.

Born in 1734, during his early years he explored the southern Appalachians but later spent much time living with Indians. This background led to his becoming a scout with the British forces engaged in the various French and Indian wars, and in this capacity Boone campaigned from Florida to Canada.

However, with the end of the Cherokee war, dressed in his furs and armed only with his simple flintlock or "squirrel gun," on the butt of which was carved the laconic words "Boon's best fren" and 15 significant notches, Boone was able to turn his attention once more to the hunting of lesser game.

On a memorable occasion in 1769, Boone and a group of companions, while pressing forward through particularly densely wooded terrain, found themselves in the Gap and quickly realised that westward from here the country opened up. Although it had been discovered some twenty years earlier by another Englishman, Dr. Walker, it was Boone who realised its significance; that it was the route westward not only to the delectable blue grass country of Kentucky but also to the Mississippi Valley and the prairies beyond. Within a few years, settlers from the Virginian and Carolina settlements were pouring through the Wilderness Road.

But if today Boone and Crockett are



Reproduction of the dust jacket of the 1936 edition of the novel, published by Grosset & Dunlap, New York

known to all well-informed television audiences, 70 years ago, at the turn of the century, Cumberland Gap had become widely known to the readers of that most successful novel by John Fox, Jnr.—"The Trail of the Lonesome Pine."

The title is, of course, better known than the story itself, which tells of the wooing of a mountain girl by an engineer, and the attractively illustrated dustjacket told its readers that "the girl proved to be lovely and piquant, and the trail of her girlish footprints led the young engineer a madder chase than 'the trail of the lonesome pine'."

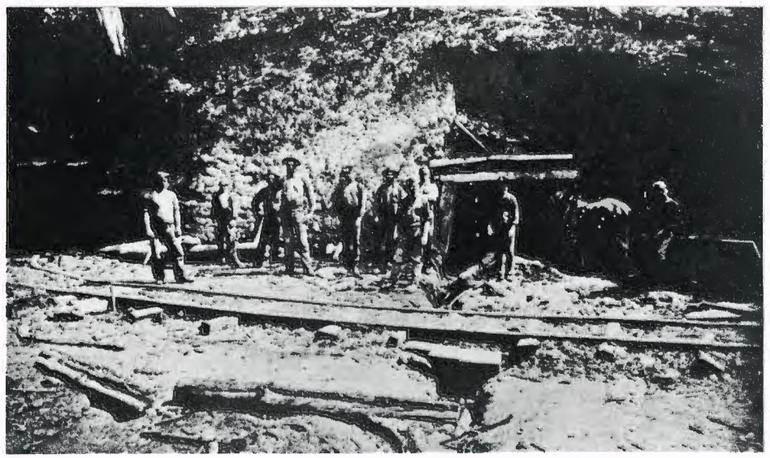
But what was this engineer doing in the wilderness? The answer to this question leads us to the second English contribution to the history of Cumberland Gap and the opening up of the West. The key is obtained if we continue down U.S. Route Alt 58, as the Trail of the Lonesome Pine is now called, into the Gap. Here we arrive at a signpost which proudly announces: "Middlesboro—founded by English Settlers, 1890"; and although the date is recent enough, the story of this settlement makes strange and romantic reading in these 1960s, as it records a British attempt to found another industrial Tees-side in the wilderness heart of the Appalachians.

In 1887 a certain English engineer named Alexander Arthur appeared on the scene to investigate the feasibility of building a railroad linking this area with the Carolinas, but after spending two weeks in the mountains, he went to London post-haste with sacks of sample iron ore and coal. These so impressed a British steel syndicate, who had heard whispers of a suitable combination of mineral wealth in this area, that a company was formed, called the American Association Limited, which exists to this day. This company appointed Arthur to be its general manager, and he returned with authority to purchase large tracts

of land in the Cumberland Gap area. Through Arthur's influence and activities some $20m. of English capital was poured into the Gap within two years. Railway lines were brought in from the north and from Tennessee and a new city, Middlesboro', was built overnight, named after our own Tees-side Middlesbrough. And on my last visit there I was able to throw some light on the difference in spelling which had always perplexed the local historians. This arose, I gather, because in the charter of the Tees-side town the 'o' was accidentally omitted between the 'b' and the 'r', which has been perpetuated in its present-day title of Middlesbro(ugh).

Reading the elegantly produced brochures produced by the Middlesboro' Town Company in 1890 gives some idea of the fantastic fever of development which this area underwent over a period of about five years. Thousands of adventurers and seekers of fortune converged on this area. Great residential quarters were laid out, hotels and hospitals were built, and the area became so famous that the directors of the first World's Fair considered holding it at this new national centre. They even built their own spa, three miles away in nearby Tennessee, and the Yorkshire character of the venture was perpetuated in the name of Harrogate, which was bestowed on it.

Proposed private dwelling – from a contemporary brochure



Middlesborough, Kentucky–A contemporary photograph of one of Mingo Mountain coal mines

This, especially, was a superb piece of flamboyance, the magnificent Four Seasons Hotel having 700 rooms, a casino and a sanatorium for 200 patients. But soon there were the inevitable xenophobic utterances and "certain papers were filled with sensational articles showing how America is being subjugated to English capitalists. . . ." Some papers went on, however, with the reassurance:

"It is a very high compliment to the soundness and integrity of business in this country that the shrewd money-making, money-saving people of England should send their savings here in such large amounts for safe investment.

"The opening up of this great district and the foundation of Middlesboro' will probably create one of the chief manufacturing cities of America."

But alas, this was not to be. The failure of the Baring Bank in London and the financial panic of 1893 cut off all further finances. Overnight the municipal giant became a ghost city of less than 2000 people. And what about Harrogate? The Four Seasons Hotel, with its staff of 180 people, never catered for more than a handful of guests per day, and in 1895 the building was torn down and sold for salvage, and the town is today no more than a hamlet.

Now, seventy years after, a melancholy hangs over this strangely beautiful country as a result of the collapse of coal mining in the area. The consequential unemployment and poverty form an island of underprivilege in this wealthy country, and it now seems likely that industrial prosperity will elude Cumberland Gap, perhaps for ever. Instead, it will probably become a recreational area for the people in the growing industries of the Piedmont and coastal plain, including those employed at the great complex of nylon and polyester plants set up by ICI in conjunction with the Celanese Corporation of America. There is little doubt that should any of these latter drive from Middlesboro', Kentucky, to Harrogate, Tennessee, they will be quick to realise that the traditions of these Yorkshire towns have, after all, lived to flourish in this part of the world, not in iron and steel at the Gap but in synthetic fibres some 200 miles away in the Carolinas.

The ICI Building Development Group

by J. A. de Normann

There are still many people in ICI and even more outside who are astonished to learn that ICI has a bigger range of building products than any other manufacturer in this country. The most recent count shows that more than 120 building products are marketed by ICI and its subsidiaries. These range from cement for foundations to paint for finishes, from polythene damp proof courses to copper roofing. In addition raw materials (mainly plastics, metals and urethanes) are supplied to other manufacturers of building products for incorporation in their products. Thus ICI's direct and indirect contribution to the building industry is very considerable, whether measured in range or volume of products. In terms of turnover it is a multi-million pound business.

The size of this effort is dwarfed only by the size and potential of the market. Currently, the gross output of the building industry is running at more than £3600 million per annum. Close on £2000 million of this is made up of materials supplied to contractors. In the short term the industry may of course have its setbacks, but given the generally accepted targets for more homes, schools, hospitals, roads and services, building must be regarded as a major growth industry for some time to come.

These two facts—a growth industry and an already considerable ICI stake—together with a desire to improve ICI's service to the industry led logically to the decision to form an ICI Building Development Group to co-ordinate and advance ICI's interests. Dr. J. S. Gourlay is the Building Products Field Director and Chairman of an Advisory Council composed of further members of the ICI Board and Chairmen of appropriate Divisions.

Organisationally the Group divides into three wings, Technical, Design and Commercial. Currently it operates from offices, workshops and laboratories on the Plastics Division site at Welwyn Garden City. In the near future the Commercial wing will move to Rosanne House, a recently completed office block, also in the Garden City. For a variety of reasons it is considered that the Group should continue to operate from the south-east, although its location could change as its role develops.

From the personnel point of view the Group contains a wide range of skills and includes architects, engineers and chemists, as well as men with backgrounds of building site management, work study, market research and other commercial activities.

This is a simple outline of the Group's organisation and resources and the thinking behind its birth. To what specific ends is it working?

First, it has a creative technical role. This involves examining the whole range of the Company's highly developed resources with a view to evolving new products. Consider some of those resources. In Dyestuffs Division ICI has the acknowledged pioneers in the UK in the application of rigid polyurethane foams in building. These foams, which can be introduced into structural cavities either on the building site or in the factory, not only give a high degree of thermal insulation but also add strength and stability to

A house built by the Hawthorn Leslie Unit Construction System. Its large-size wall units incorporate a layer of rigid urethane foam introduced in the factory by direct injection techniques

Formed from two large 'Perspex' shapings, this experimental bathroom developed by the ICI Building Development Group provides a glimpse into the possible nature of bathrooms of the future

Dr. J. S. Gourlay, (below), ICI Director with special responsibility for building products

the structure in which they are used. In Agricultural Division there is a wealth of experience in plasterboard, plasters and cement. Nobel Division have recently introduced a novel ceiling heating system based on 'Flexel,' an electrically conducting silicone rubber. A thin sheet of this material (maximum thickness is 0·015 in.) installed in the ceiling provides an economical, safe and maintenance-free heating system. And so one could go on, through the Paints Division household names, the limestone-based products of Mond Division, the PVC sheet and foil and decorative finishes of ICI (Hyde), the pioneering work of Plastics Division in the interests of plastics in building, the copper pipe and fittings of Yorkshire Imperial Metals Ltd., the PVC and alkathene pipe and the rainwater and soil systems of Yorkshire Imperial Plastics Ltd., the copper sheet and copper expansion joint strip of IMI (Kynoch), aluminium sheet and strip from Impalco, and finally, from British Visqueen Ltd., there is polythene sheet for damp proof courses and membranes, motorway underlays and weather protection.

Each of these represents an area of vigorous and expanding activity, and in such a setting the function of the Building Development Group is clearly not to duplicate but to innovate. In particular it can focus on the possibilities for new composite products which use the products of more than one Division and probably have their bases in a developing technology. The kind of question the Group might ask is "What are the commercial prospects for a roof structure composed of a sandwich of PVC, aluminium and rigid polyurethane foam? What is its technical feasibility?" Or, alternatively, "There is a need to develop a large lightweight panel which will resist the weather, afford a high degree of thermal insulation, provide structural stability and some load-bearing capacity and provide a satisfactory acoustic barrier. Can it be developed from the Company's resources and be marketed at the right price?" If we could say yes to this question we would be in business in a big way, because we would have discovered the perfect panel capable of performing in an economic way all the traditional functions of the wall! Fortunately it is possible to ask less ambitious questions, and using the accumulation of our scientfic and technological resources we should be able to solve some of them.

Much work has already been done in the area of vacuum forming technology. Here we inherited the pioneering work done by the Plastics Division Development Department on the prototype Service Core and Bathroom Unit. When shown at the IBSAC Exhibition in 1964 this unit aroused international comment as a revelation of the design potential of plastics interiors and as an important contribution in the area of prefabricated service core units. The unit is of course a development project, and a whole range of complex, economic and technical problems remain to be solved before a production line model could be contemplated.

So far we have been looking at the creative technical role of the Group. It also has other important roles.

In particular we are currently concentrating on increasing our understanding of the economics and practice of building. Although the building product market is big and expanding, it is not an easy one in which to launch new products because it is dominated by relatively low cost materials and time-honoured techniques. Even so there is scope for the introduction of new products so long as they represent a qualitative advance and are economically competitive. One of the missing links in this area is the absence of adequate statistics on many aspects of building. However, as time goes on we are hopeful that sound market research and commercial intelligence will enable us to increase our understanding of the market for building products. Closely related is the development of a deeper understanding of site building operations and the organisation and control of building activity. These represent the reality of building, and we are firmly convinced that

General view of the dining area of the Plastics Division Development House, built to demonstrate the use of plastics in building

this is an area of knowledge which must not be neglected. In this respect a useful liaison has already been built up between the Group and many large end users.

Clearly the benefits of our increased understanding of the practice and economics of building will not flow in one direction only. The major reason why we are taking this line is to ensure that any new products we produce are of the right kind at the right price. In short, we are aiming to get customer satisfaction through understanding of customer needs.

Another aspect of the market-oriented approach lies in our work on communication. Nowadays architects, engineers and specifiers of all kinds are in much the same position as doctors. They are submerged beneath a pile of circulars, brochures and samples. This situation produces a difficult problem of communication and one which the Group, with the aid of Divisions, Subsidiaries and Central Publicity Department, is tackling as a matter of importance.

On the publicity side plans are well advanced for a 1500 sq. ft stand at the International Building Exhibition due to be held at Olympia in November. This is the first time that ICI has presented a unified front to the industry. The project is being co-ordinated by the Building Development Group with the guidance of the Exhibition Section of Central Publicity Department and with the full co-operation of Divisions and subsidiary companies.

Of the three wings of the Group the Technical and Commercial have perhaps the more self-evident roles. The Design wing needs a little more explanation. Design is important because we believe that we need to have a fundamental regard for quality. We need to have this regard for commercial reasons as well as for reasons connected with aesthetic standards as such. In the past many products made from new materials such as plastics have had very little market appeal, not because of the inherent qualities of the material but because the design and aesthetic quality of the finished article have been inferior. The bathroom project has shown the potential of plastics to provide an environment which in terms of design, aesthetics and finish is superior to the average traditional bathroom. This standard needs to be maintained not only in order to overcome prejudices about plastics materials but also because design is increasingly likely to become an important competitive factor. If we are right in thinking that people want more attractive and better designed houses as well as reasonably priced houses, design potential must be exploited to the full. Similarly, if the standardisation of building components, so vitally necessary for increased productivity, is to be achieved, the standard units must be satisfactory from a qualitative and aesthetic point of view. This is not an impossible task. Georgian houses prove the point. But the design has to be very good indeed.

Up to now we have been working hard at laying foundations, establishing close working relationships with our colleagues in the Divisions and subsidiary companies, improving liaison with our friends in the industry, establishing machinery for deepening our understanding of the industry, examining ways and means of improving our service to the industry, and evaluating the most likely avenues for profitable advance. On these foundations we now hope to build to the benefit of both ICI and the building industry.

The History of Cheshire Salt

by A. S. Irvine

Geology

Two hundred million years ago Europe was a very remarkable place. Most of it was a hot, red, waterless desert lashed by intense dust storms mainly coming from what we now call the East.

Great Britain, which has, geologically speaking, spent more time under the sea than above it, was then at a half-and-half stage. The channel coast of France, Cornwall, Ireland, and the Highlands of Scotland formed a semicircular land mass surrounding an ancient sea. A continuation of the Highlands connected Scotland with Scandinavia. In these arid times, this inland sea dried up to give first a chain of salt lakes and finally vast deposits of rock-salt.

In several places between the mountains that hemmed in this sea there were areas of low dunes. High tides and strong winds would bring the ocean in over these dunes to replenish these salt lakes that stretched from Carrickfergus in Ireland to Russia and beyond. And, over the millions of years during which the rock salt was laid down, the land (or sea) levels moved up and down to permit other mechanisms of flooding and evaporation.

But the eternal wind from the east blew red dust on to the sea, and that is why the rock-salt is coloured with one part in twenty of fine, chocolate-coloured marl that makes it look like brown, crystalline coffee-sugar.

Life was rare on land in Europe; *Cheirotherium stortoniense*, an early dinosaur-like creature that is known only from its footprints, has left its traces in the sandstone near Birkenhead. Elsewhere, the few oases and storm-water deltas were inhabited by mammal-like reptiles. The first true mammals were not scuttering in and out of the legs of the dinosaurs until the end of the Triassic period, but by then the salt measures had been well and truly sealed down by rock compressed from many feet of windblown marl.

Thereafter the salt measures—up to 2000 ft. thick—lay undisturbed for one hundred and eighty million years.

Cheshire in early Triassic times

Prehistory

Twenty thousand years ago Cheshire was under 20,000 feet of ice. When, in due course, sandy tundra emerged from under the melting glaciers, water began to percolate down to the salt nearest the surface, emerging in all probability as salt springs along the banks of the chief rivers of the district.

Five thousand years ago the River Weaver, which joins the Mersey just below Runcorn gap, was relatively busy. The bulk of the population of those days concentrated east of the Pennines, and one of the great east–west trade routes ran up the river. The dull green flinty tuff of Langdale was much in demand for hand-axes, and a factory had been built in Westmorland. The finished hand-axes were brought by dugout canoe down the Lancashire coast, up the Mersey, Weaver, and Dane to Middlewich; thence up to the Derbyshire border. At Middlewich the hand-axes were also transhipped for land carriage to the headwaters of the Upper Trent, a score of miles to the south-east.

Grazing animals must have discovered the brackish springs of Cheshire long before: it is hard to believe that Neolithic man did not notice them as he paddled his dugouts by, camped for the night, or hunted the river bank.

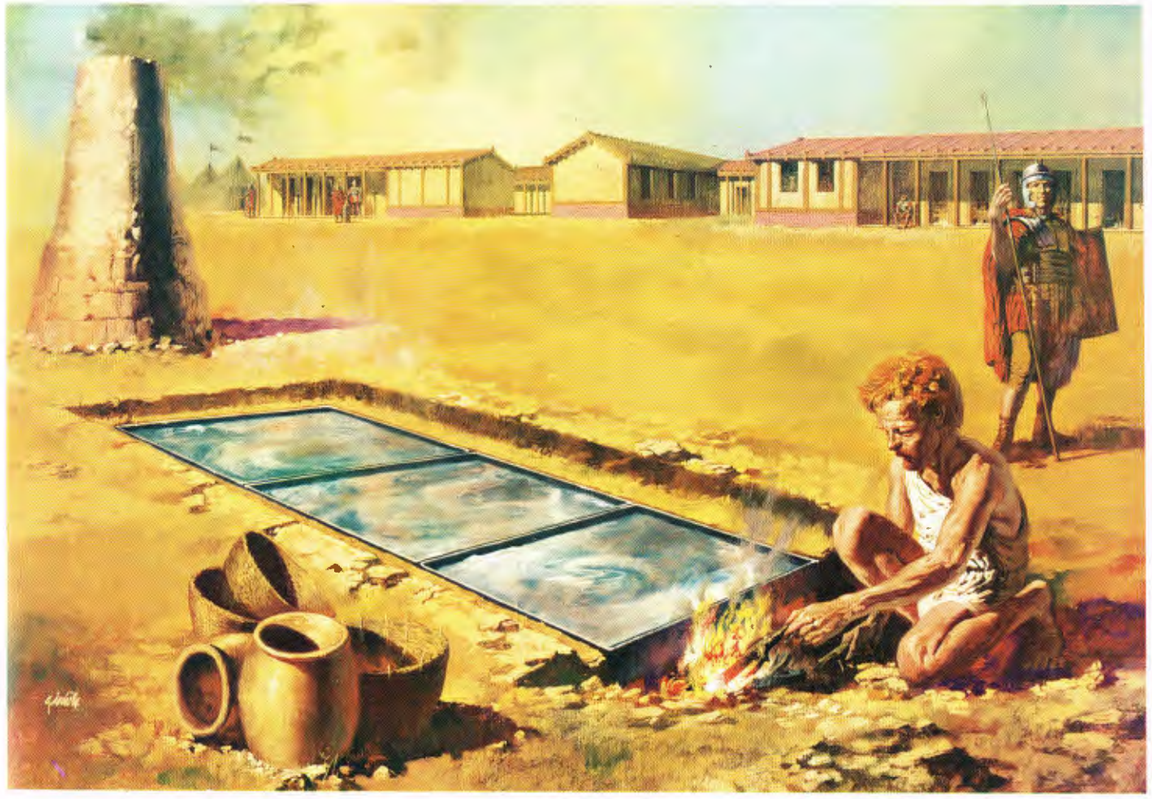
Now I have no evidence at all that salt was made in Cheshire in the centuries before Christ. On the other hand, during that era there was a flourishing salt industry around the Wash. Salty sand from the higher reaches of the wide foreshore was piled into mounds, and arrangements were made to collect the drainage. This rain-fed drainage was evaporated in pottery pans some two feet wide, four feet long, and about half an inch thick. The pans were supported on handbricks—rough cylinders 3–4 inches long made by squeezing clay in the hand. Great piles of broken pans and handbricks, technically called *briquetage*, occur in these East Coast saltings.

It is pretty certain that communication was good between the East Coast and Cheshire, for the ironworks of those days were located in the east of England, and the Weaver–Dane–Trent system with a portage of only a score of miles at most was an obvious westward route for the products of the Lincolnshire foundries. But so far there is no evidence that the Iron Age Cheshiremen made salt after the Lincolnshire fashion from their brine springs.

The Romans

Tradition had it that when the Romans came they found the Celt making brine in Cheshire by the primitive method of pouring brine on to a lively fire and recovering salt crystals by scraping them off the doused embers. Unfortunately there is no basis for this tradition and it seems to be the result of misreading a medieval account.

There is no evidence as yet recognised of Roman saltmaking at Northwich: the name *Condate* merely indicates the town's situation at the confluence of the Weaver and Dane. But recent finds on a Roman site at Middlewich (*Salinae*) include a possible salt-pan setting, complete with handbricks and firebrick crossbars.



Illustrations by d'Achille

A Roman salt pan, Middlewich

Illustrations by d'Achille

A pre-medieval leaden pan bearing marks thought to be Roman is housed in Warrington Museum. Incidentally, the marks have been interpreted as three i's, three c's and three I's, which to me seems highly suspicious.

All in all, the evidence leads me to believe that the Romans merely taught the native Celt to use lead pans for pottery, but until finds of briquetage support it, this idea must remain at best a hypothesis.

The Normans

The first written evidence that we have of salt in Cheshire is Domesday. In that work considerable space is given to the three Wiches at Northwich, Middlewich, and Nantwich, and this has been taken to indicate a long-established industry.

Salt boiling then was hedged about by ritual and tradition, though the use of blood or white of egg as a coagulant for precipitating marl, or of urine as, presumably, a froth-flotation agent, showed a considerable corpus of primitive technical lore.

But the trade had not changed since the Roman occupation—the next breakthrough was an increase in the size of the pans from about 3 ft. × 18 in.: shortly after the Normans came, pans grew larger, and by the early Edwards larger pans made from sheets of cast lead beaten up at the sides were standardised. These measured about 5½ ft. × 3 ft. and were as big as could be readily manhandled.

Then the saltings of the south and south-east coasts turned to wrought iron pans, but nearly a century was to pass before iron pans reached the Cheshire Wiches along with Cromwell's armies.

About this time, too, fuel reserves in the Forests Royal were being rapidly depleted, and control of timber felling was tightened. Lancashire and Staffordshire coal started to arrive at the Cheshire Wiches by the same pack-horse trains as took the salt back to the growing markets of south Lancashire and the Potteries.

It was this destruction of Cheshire timber and the need to get fuel from outside the county that let the go-ahead Liverpool merchants get a foothold in the highly conservative salt trade. They forced Northwich, in spite of itself, to grow from a sleepy, dirty town, "full of smoak" and riddled with restrictive practice, to the acknowledged centre of British salt production.

The first move in the drive to increase the efficiency of the Northwich salt trade was to drill for coal nearer the Wiches. It was during such a search for coal that the next breakthrough in salt technology occurred: John Jackson of Halton came across rock salt a hundred feet below the surface in March 1670 at Marbury, just to the north of Northwich.

The Paleotechnic Era

The pattern of development that followed in the next three centuries was much the same in kind over the whole of Cheshire. In Northwich, exploitation and subsidence reached almost staggering proportions,

and development there became, as it were, a caricature of development elsewhere.

Once rock salt was discovered, mining followed. The earliest known mine was sunk in 1682 and was drowned out in 1720. The rock salt was used mainly to saturate weak natural brine before evaporating it to white salt in open pans. These mines usually flooded and fell in, leaving rock-pit holes—sub-conical pits about 100 feet in diameter and 150 feet deep—which rapidly filled with water. The ease of mining in the top rock meant that new pits were sunk in preference to taking costly precautions to keep the water out of the old ones, and rock-pit holes became features of a pock-marked meadow landscape of the century up to the accession of Queen Victoria.

In contradistinction to the rock-pit holes, there were trough-like areas of subsidence marking the course of underground brine runs. This form of subsidence is remote from the pumps, as solution of the rock salt is most vigorous at those points where fresh land drainage first has access to rock-head. Thus the salt-boilers in Northwich could blithely pump away from local wells while the land fell in, say, at Billinge Green three miles away. And what the eye did not see—from the salt works—the heart did not rue.

The last of the great open pans

In 1780 drilling in the south of Cheshire disclosed a second, lower, series of salt beds, and in 1781 these bottom rock beds at Northwich were searched for and discovered. They were about 100 feet thick and lay some 200 feet below the surface. The deposit was purer, and so shafts were sunk to it, often through the old top mines when these were sound enough.

Once a few bottom mines flooded and fell in, they became natural reservoirs of brine. Shafts were then sunk to them and the brine was pumped out, the loss being made good by land water from above the salt measures. Thereafter, with that fine disregard for amenities that was characteristic of the age, some hundreds of acres of ground was pumped under water in the sixty years starting in 1870.

The modern picture

Although at this time the salt trade itself started to decline in mid-Cheshire, this decline was more than compensated for by the rise in the chemical industry and by the exportation of brine to Merseyside. So, as the consumption of brine rose, major and catastrophic collapses that engulfed whole works occurred in 1873, 1880, 1893, 1912, 1928, and 1929. It was this last collapse that affected the newly formed Alkali group of ICI most closely and that—with new information available about United Alkali's brine-winning

APPROXIMATE TIME SCALE

Years	Geological Periods		
20,000		Retreat of Cheshire Ice Sheet Man	Today
11m	Pliocene		CAENOZOIC
25m	Miocene		
40m	Oligocene		
70m	Eocene		
135m	Cretaceous	Mammals Marsupials Dinosaurs	MESOZOIC
180m	Jurassic		
225m	Triassic	Salt Beds	
270m	Permian	Fish and Amphibia	PALEOZOIC
350m	Carboniferous	Buxton Limestone	
400m	Devonian		
440m	Silurian		
500m	Ordovician		
600m	Cambrian		
	Precambrian	Bacteria etc.	ARCHAEAN

Triple-effect evaporators at Weston Point today

techniques at Preesall—set the then Alkali group to exploring methods of developing controlled cavities in the newly discovered salt measures at Holford some three miles from Northwich. These cavities were arranged in such a way that, if subsidence did take place, it would be confined to the immediate vicinity of the borehole, and so would not endanger anyone else's property.

But all this time—say three thousand years—the methods of boiling salt from the brine had not changed. Pans had, admittedly, grown from leaden or pottery dishes a foot or so square to immense wrought iron swimming baths, but the *process* had not changed. In 1888 the Salt Union was formed, and, with the capital available, a successful vacuum plant was built at Winsford in 1905. This was followed five years later by a vacuum plant at Weston Point. The Weston Point evaporators by Mirlees, Watson of Glasgow—27 ft. in diameter—were then, and I believe still are, the largest in the world.

Other vacuum plants followed throughout Cheshire, but the inefficient open pan hung on because it could produce grades of salt impossible then to produce by other means. The next breakthrough occurred in 1948 after the Salt Union had been bought by ICI. It was the supporting facilities of ICI research that, after World War II, eventually made possible the production of *granular salt*: the Oslo process of shaping crystals by a strong up-current of brine was introduced in the vacuum plant at Stoke. This granular salt replaced the coarser grades of open pan salt, while *dendritic salt*, produced at another stage in the process by the pretreatment of brine with potassium ferrocyanide, replaced the finer grades.

One feature of the modern scene is the revival of rock salt mining. Rock salt, with its content of 1 cwt. of marl to 1 ton of salt, can only be used without dissolving and recrystallisation where the marl is of no account, e.g. when used for cattle feed or as a basis for sodium fertilizers. The rapid growth of output from a few tens of thousands of tons just after the War to over a million tons a year stems from the rapidly growing appreciation of the value of rock salt for keeping the traffic rolling on what would otherwise be frost- or snowbound roads.

AUTUMN LEAVES